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ABSTRACT

In order to determine the extent of deficiencies found in deaf children with learning disabilities so that appropriate remedial curriculum could be developed, a series of diagnostic tests designed to differentiate deaf children with learning disabilities from typical deaf children was constructed and evaluated. The tests developed were said to meet objectives of both the classroom teacher and the developmental psychologist. A test battery was devised for the 3 to 8-year-old range with modification in the selection procedure of the tests to account for developmental change. The CREED 3 test battery measured gross motor coordination, sensory motor behavior, visual analysis, attention and memory, and conceptualization. The population tested included 444 3 to 4-year-olds, 227 5 to 8-year-olds, and 289 7 to 8-year-olds, all of whom were deaf children in the New York State schools for the deaf. Results showed that the test battery differentiated successfully among those deaf children with and without learning disabilities. Significant differences in performance on subtests in all five areas were found for each of the three age groups. Evidence also suggested that the test battery described differences within the typical and special groups as a function of age. (For related documents, see also EC 041 647, EC 041 649-50.) (CB)

ED 060603

PSYCHO-EDUCATIONAL ASSESSMENT
OF
YOUNG DEAF CHILDREN

PROJECT CREED 3

P. L. 89-313

(Cooperative Research Endeavors in Education of the Deaf)

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EC 041 648E

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1969

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St. Francis de Sales School
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Lake Ronkonkoma, New York

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PSYCHO-EDUCATIONAL ASSESSMENT OF YOUNG DEAF CHILDREN
(Ages 3-8 in New York State)

Lillian C. R. Restaino, Ph.D., Principal Investigator
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PROJECT CREED 3

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PREFACE

Population in the schools for the deaf in New York State has demonstrated considerable change in the one hundred sixty years of their formal existence. More sophisticated approaches in medicine, education, audiology and other professions have provided administrators and teachers with diagnostic information which not only identified the severely-profoundly deaf child at a younger age but also alerted all concerned to the presence of high risk factors which could signify the probability of added physical and mental disabilities. This combination of factors gave rise to the need to develop adequate differentiated educational programs for handicapped young deaf children.

The rubella epidemic of 1964-65 accented this challenge even as it increased school population. Development of program - essential to the fulfillment of our responsibility as educators - pressed upon us. Yet before attempting to design curriculum we needed to know more about the learning process of the young hearing-impaired child and how it relates to teaching practice. The present document records our cooperative attempt to study this process and to search out differences between so-called "Typical" and "Special" deaf children.

In 1966 the enactment of the Elementary-Secondary Education Act, as amended by P.L. 89-313, provided our schools, through the State Education Department, with the funds necessary to engage in a series of projects closely related to practice. In 1967-68 the Division for Handicapped Children, jointly with eleven schools for the deaf sponsored the first and subsequent phases of a project titled COOPERATIVE RESEARCH ENDEAVORS IN EDUCATION OF THE DEAF (CREED).

The first phase was designed as a status study with the goal of identifying the atypical deaf child in two public and ten private-State supported schools. This project was reported in A SURVEY OF EDUCATIONAL PROGRAMS FOR DEAF CHILDREN WITH SPECIAL PROBLEMS IN COMMUNICATION IN NEW YORK STATE (Project CREED) by Rosenstein, Lowenbraun and Jonas. From the results obtained through this Survey, a second and third phase, under the direction of Dr. Lillian Restaino, Principal Investigator, were supported. These were directed toward a search of the literature leading to the construction of a battery of appropriate developmental tests to determine the extent of deficiencies present in young deaf children designated as "Special" in our schools.

With the construction of the tests CREED entered its third phase, PSYCHO-EDUCATIONAL ASSESSMENT OF YOUNG DEAF CHILDREN IN NEW YORK STATE, the subject of this report. During the school year 1968-69, under the administration of St. Joseph's School for the Deaf and the investigations of the Research Staff at the Lexington School for the Deaf, eleven of the twelve schools became closely involved in a project, the ultimate goal of which was to modify curriculum for the young deaf child - both to prevent and to remediate the cumulative effect of additional learning handicaps.

This present Report describes preliminary activities of Project staff, teachers and children. It forms the basis of the fourth phase of the cooperative endeavor which is now in process, under the leadership of Dr. Lillian Restaino: CURRICULUM DEVELOPMENT FOR YOUNG DEAF

CHILDREN WITH SPECIFIC LEARNING DISABILITIES (CREED 4) to be published in 1970.

Initially made possible by the joint efforts of Local, State and Federal offices cooperating with twelve schools for the deaf the several phases of PROJECT CREED owe much to many. The State Education Department through the Director of its Division for Handicapped Children, Dr. Anthony J. Pelone, and Chief of the Bureau for Physically Handicapped Children, Richard G. Hehir, gave direction and encouragement from the beginning. Their Associates in the division of Educational Finance and Dr. Zelda Kaye, Supervisor in the Education of the Handicapped, have given generous, helpful attention to the variety of needs that arise from such a statewide enterprise.

Staff in the eleven schools for the deaf involved in the project should also be given appropriate credit by name, but they are numerous and have contributed at many levels, and we fear slighting by omission. Nonetheless, if successive CREED goals are finally achieved it will be, in the last analysis, their accomplishment. We hope that this Report will shed clear light on the learning functioning of the young handicapped deaf children they serve.

Frances Cronin

CHAPTER I

Introduction

A. The Child with Learning Disorders

In recent years, the literature concerned with exceptional children has expanded to include those with "minimal brain damage," "learning disorders," and "special learning problems."

Educators agree that there is a real increase in the number of children, who are so described, as a direct result of advances in medical science and refinement in psychological and neurological measurement.

While innovations in medical science have increased the chances for survival of infants who, as a result of diverse circumstances, might have been lost in the past, educators have not yet devised innovations to meet the special needs of these children as they enter their school systems. It must be admitted, in defense of educators, that psychologists and physicians who should have been of greatest help to them have only served to confound the problem. No educator can be expected to design a curriculum without an accurate description of the children for whom it is being designed.

Until recently the measures used to obtain behavioral definitions of such children were those unique to each discipline. Descriptions of performance on the WISC, the Bender-Gestalt Test, the Halstead Neuropsychological Test Battery and on neurological tests, however significant to the clinical psychologist and the neurologist, provide little information of heuristic value for those who devise and transmit the curriculum. Hewett's statement describes the problem clearly:

> In the search for remedial and educational guidelines, teachers have looked to the clinical psychologist, the educational psychologist, and the child psychiatrist for assistance. While these child specialists offer relevant generalizations regarding learning and behavior, their contributions are not always practical in the classroom setting. (1966)

Ozer (1968), Gallagher (1966) and Honvik (1966), among others, have made equally strong comments about the irrelevance to education of diagnostic instruments in current use; each author points out that when the definition of "brain damaged" or "learning disorder" changes radically as a function of the area of concentration of the examiner, remediation becomes an impossible task for the teacher. Associating the children who are performing as pupils in her class with those described in the literature on learning disorders becomes considerably more difficult when these definitions bear little relationship to one another.

Of course, the major reason for the disparity in syndromes is the fact that "brain damage" or "learning disorder" is, as Honvik (1966) terms it, a "mixed concept" precluding any consistent description. Among psychologists alone, dimensions differ, ranging from the perceptual-cognitive concentration of Goldstein (1941), Birch (1965) and Halstead (1966), to the social-emotional concentration of Michael-Smith (1964), Berko (1966) and Cruickshank (1966). Perhaps the most accurate description is that of Capobianco (1966), who suggests that there are sub-groupings among the "brain injured," and that their disabilities fall on an "ordered continuum." Indeed, we might well expand such a continuum and sub-grouping to include developmental age differences. Few, if any, of the experts direct their attention to the changes in the child as a function of age. It is quite possible that the social-emotional reactions are a result of frustration in meeting the growing demands of the perceptual-cognitive spheres. At any rate, the fact that perceptual-cognitive development is a cumulative process increases the breadth and depth of the child's deficiencies as he grows. Kephart (1968) describes quite well that which has hitherto been termed completely "bizarre" and "unpredictable" behavior as the attempt on the part of the child to adapt to a defect at a particular developmental level while he is being pressured to move on to the next level. In other words, the child's behavior can hardly be termed "bizarre"; it is his way of meeting the task demands at one level of a developmental sequence as he is expected to proceed to the next. Unfortunately, when the child is seen only for a short testing period by a test examiner these attempts at coping with environmental demands are pulled out of the context necessary to understand them.

It becomes apparent, even in this short review, that a confused literature confronts educators in their attempts at remediation. The failure of experts to provide relevant and precise information for their curriculum planning has forced educators to seek elsewhere for operational definitions of disorders of learning in the classroom setting. Very recently there have been attempts to devise instruments that will provide descriptions directly related to classroom programs. They are, however, meeting with limited success. There is yet another critical variable that test constructors and educational specialists alike have overlooked; viz., teacher involvement.

In an incredibly inefficient use of highly trained personnel, the teacher who is confronted by the child for several hours a day has been largely ignored in diagnostic testing and program planning. Typically, she receives the results from someone else who has seen the child for the first time, "testing" all his "abilities" in the span of an hour or so. Similarly, she is presented with curriculum recommendations, without consultation, that may not reflect either her needs or those of her children.

Thus, as is equally true of general education, a change in approach to teaching must be made in order to promote changes in learning.

B. The Deaf Child with Learning Disorders.

The problems discussed above are as familiar to educators of the deaf as to those in general education. Administrators and teachers in this area have been confronted in recent years with an increasing proportion of children who are "different" in their school population; children who do not react or respond as deaf children have in the past. The descriptions of their problems are very much like those found in any group termed "brain injured," "brain damaged," or "children with learning disabilities." Thus, their teachers, who are quite competent to meet the needs reflected by the auditory deficits of their children, must seek help from sources in the field of special learning disorders to meet the unique problems of these "different" children. Educators of the deaf are as discouraged as are others by the obstacles outlined above. They recognize, however, that there is a pressing need for systematic programs for such children; the CREED 3 Project is a direct reflection of their concern.

C. CREED 3 Project.

In devising the CREED 3 Project, it was the expectation of CREED personnel that they would: (1) describe for New York State educators of the deaf the deficiencies of those children in schools now being termed "Special"; and that this information would (2) provide a basis from which teachers, supervisors and specialists could design curriculum modifications to remediate the deficiencies found.

The CREED 3 Project took as its major objectives the following:

1) the description of abilities of "Special" children in New York State schools for the deaf;
2) the involvement of teachers of "Special" children in the construction and administration of the tests and in the evaluation and implementation of the results.

The expected outcomes of the testing were as follows:

1) Differences will be found between those children designated as "Special," and those termed "Typical," in perceptual-cognitive abilities.
2) Differences will be found between those children rated "Low" on the emotional behavior scale and those rated "High."
3) Children who are termed "Special" and rated "Low" on the Behavioral Rating Scale will not differ in performance from those termed "Special" and rated "High."
4) Differences will be found in performance between "Special" and "Typical" children as a function of increasing age.
5) The clustering of tests measuring various abilities will be the same for "Special" and "Typical" children; i.e., the factor structure of the tests will be similar.
6) Differences will be found between children with rubella etiologies and those with etiologies other than rubella.

CHAPTER II

Methods

A. Procedures

1. General Methods

Teachers were involved in every step of the project, from selection of the objectives underlying the design of the test, to the consideration of the final results.

In the initiation of the project, we discussed with teachers and supervisors their expectations for children at various age levels. We asked them to tell us the kind of information that they would want about a child at the beginning of the school year that would be of use to them in planning classroom activities in fulfillment of these expectations. We obtained from such interviews a listing of abilities that teachers believe are critical to successful classroom instruction (see Table 1).

We incorporated these abilities into a theoretical framework of developmental change, placing the abilities at age levels appropriate with Piagetian sequences. This framework was used as the basis for selection of tests for the battery.

The teachers administered the tests to their own classes. As research workers, we were not unaware of the problems attending such a move; however, the teachers with whom we had talked in the initial stages of the program impressed us with their intense interest in obtaining systematic information about their children as an aid to curriculum modification. We felt strongly that with careful and deliberate instruction in the use of the test battery, with training to eliminate bias and subjectivity in test administration, and with the understanding that our common purpose was the description of the

TABLE 1

CREED 3 Test Battery: Table of Tests

Motor Coordination	Sensory-Motor Integration	Attention and Memory	Visual Analysis	Conceptualization
Tests for 3-4 Years: Standing on One Foot Walking Between Two Lines Hopping on One Foot Jumping Over Line Sit Without Looking	VMI Thumb Touching Building a Tower Beading Scissors Cutting Peg Board (2 patt.) Buttoning Form Copying Mannequin	Knox Cubes Shell Game	Matching Color Cubes Matching Forms	Concept Test Association Test DLM (Sequencing)
Tests for 5-6 Years: Standing on One Foot Walking Between Two Lines Hopping on One Foot Jumping Over Line Sit Without Looking Step-Hop	VMI Thumb Touching Building a Tower Beading Scissors Cutting Peg Board (3 patt.) Form Copying Mannequin Frostig I and V	Knox Cubes Target Test	Gibson Transformations Visual Discrimination Seriation	Concept Test Association Test See Quees PSS
Tests for 7-8 Years: Standing on One Foot Walking Between Two Lines Hopping on One Foot Jumping Over Line Sit Without Looking Step-Hop	VMI Thumb Touching Beading Scissors Cutting Peg Board (3 patt.) Form Copying Mannequin Frostig I and V	Knox Cubes Target Test	Gibson Transformations Visual Discrimination Seriation	Concept Test Association Test See Quees PSS

needs of all children in order to improve programs for them, the teacher as examiner could well be a most exciting addition to educational research. In addition, the teacher as observer was provided with a unique opportunity to view her child as an individual, as he performed on tasks sequentially subordinate to, but critical for, classroom learning.

Teachers also expressed the need for information about their children's vision. They felt that there might be a higher incidence of visual impairment than hitherto suspected. In response to this need, CREED planned a program for the screening of vision of the participating children.

During our initial interviews with them, teachers recommended that comparison of the communication abilities of "Special" and "Typical" children would provide important information for them. Instruments for such comparisons were planned as a separate part of the CREED project (see Chapter V).

In order to provide for teacher participation in the evaluation of the results, three days were set aside at the end of the project year for seminars. At these seminars, teacher representatives, CREED personnel and three experts from the field of special education considered the implications of the results. The experts, Dr. Margaret Jo Shepherd, of Teachers College, Columbia University, Dr. Gloria Wolinsky, of Hunter College, The City University of New York, and Dr. Ray Barsch, of The University of Southern Connecticut, discussed with teacher representatives and CREED personnel remedial procedures appropriate to the deficits demonstrated by the children on the test battery.

2. Test Battery

As mentioned in the section above, we concentrated on the areas of concern to teachers in selecting tests for the battery. The abilities selected change with age, however, and thus, it was necessary to impose a developmental framework on the areas of concern.

We used theoretical and empirical bases for test selection and positioning of a test within the battery. CREED personnel believed that Piaget's sequence of behavior (1958) provides a sound basis for test placement. Thus, the assumption made by project personnel was that the child must first master gross-motor coordination; then he must integrate actions with his sensory processes while concurrently and subsequently integrating different sensory processes. The successful mastery of this complex of activities then permits him to reach and to master the most difficult level of development: cognition. Such a sequence reflects Piagetian descriptions of developmental progress. The abilities to focus attention and to remember the ongoing activity are critical to success in the above activities, so that CREED personnel devised a separate test series to measure these abilities. Visual analysis was given special attention because it is the sensory mode most critical to the deaf child and it is the critical mode in reading.

Extant tests were selected that had demonstrated discriminability. Those tests devised specifically for the project were submitted to consultants for evaluation and modification.

a. Tests of gross motor functioning. Success in such activity is prior to success in all subsequent school endeavors; thus, an evaluation procedure must provide the teacher with as comprehensive a sample of the child's gross-motor behavior as is possible within a brief testing period.

(1) Test Sources.

Standing on One Foot - "A Measure for Neurological Evaluation of School-Age Children" by Mark N. Ozer, M.D.

Walking Between Two Lines - "Perceptual Motor Survey" by Newell Kephart, Ph.D.

Hopping - "A Measure for Neurological Evaluation of School-Age Children" by Mark N. Ozer, M.D.

Jumping Over a Line - "Perceptual Motor Survey" by Newell Kephart, Ph.D.

Sit Without Looking - Developed by CREED personnel for current project.

Step-Hop - "Perceptual Motor Survey" by Newell Kephart, Ph.D.

(2) Test Descriptions.

Tests of Motor Coordination - These tests measure the child's control over his body as a whole and over his upper and lower extremities. They measure the child's ability to translate directions from an outside source into correct reproduction of an activity. Each test of Motor Coordination was scored as Pass or Fail. Maximum possible score: 3-through 4-year-olds = 6; 5-through 8-year-olds = 7.

Standing on One Foot - Stands on one foot for 3 seconds (3-through 4-year-olds), or 5 seconds (5-through 8-year-olds).

Walking Between Two Lines - Walks between two lines from one end to the other without touching either line. The lines are placed 18 inches apart and are 6 feet long.

Hopping - Hops in place on one foot 4 times (3-through 4-year-olds), or 6 times (5-through 8-year-olds). This is done on both the left and the right foot.

Jumping Over a Line - Jumps over a line landing on both feet simultaneously.

Sit Without Looking - Sits down on a chair, placed directly in back of him without looking at it.

Step-Hop (for the 5-through 8-year-olds only) - Steps on one foot and hops, then steps on the other foot and hops. This activity is repeated in succession 6 times.

b. Tests of sensory-motor integration or visual-motor integration. Most of the activities in school require a high level of sensory-motor integration. In both classes for the deaf and in general education these activities presume well-functioning visual-motor abilities. Teacher requirements range from relating blackboard activities to activities at his desk, to precise manipulation of materials of all sizes and shapes such as blocks, crayons, milk cartons, chairs, books, etc. The test series again must be sufficiently comprehensive to afford the teacher the opportunity to observe the child as he demonstrates different levels of sensory-motor behavior.

(1) Test Sources.

Thumb Touching - "A Measure for Neurological Evaluation of School-Age Children" by Mark N. Ozer, M.D.

Building-A-Tower - "Developmental Diagnosis" by A. Gesell, M.D. and C. Armatruda, M.D.

Beading - Nebraska Test of Learning Aptitude.

Scissors Cutting - Merrill-Palmer Scale

Peg Board - Test developed by CREED personnel from commercial materials.

Buttoning - Merrill-Palmer Scale

Form Copying - Winterhaven Copy Forms from "Perceptual Motor Survey" by Newell Kephart, Ph.D.

Mannequin (object assembly) - Wechsler Adult Intelligence Scale

Frostig Test I and V - Developmental Test of Visual Perception by M. Frostig, Ph.D., W. Lefever, Ph.D. and J.R.B. Whittlesey, M.S.

(2) Test Descriptions.

Tests of Sensory Motor Integration - These tests provide information about the child's ability to integrate his visual and kinesthetic senses with motor function. The demands made upon the child vary with each test from emphasis on motor coordination to emphasis on visual perception.

Thumb Touching - Touches each of the fingers of one hand in succession with the thumb of the same hand.

Building-A-Tower (Not administered to 7- through 8-year-olds) - Builds a tower of 10 one-inch cubes.

Beading - Places 5 ½-inch beads on a lace having a plastic coated tip.

Scissors Cutting - Cuts a sheet of paper, 4¼ x 11", across its width with a primary size, blunted scissors.

Peg Board - Copies a pattern made with 5 pegs in a 25 hole peg board. All children copy a horizontal and a vertical pattern. In addition, 5- through 8-year-olds copy a diagonal pattern.

Buttoning (3- through 4-year-olds only) - Places 4 buttons in their buttonholes.

All of the above mentioned Sensory-Motor Integration tests were scored as Pass or Fail. Maximum possible score: 3- through 4-year-olds = 7; 5-through 6-year-olds = 7; 7- through 8-year-olds = 6.

Form Copying - Copies 7 geometric forms presented one at a time. Scoring: one point for each of the following distortions: rotation, misshape, broken lines; two points for loss of configuration. Maximum number of points per figure for forms 1 through 6 = 2. Maximum number of points for form 7 = 4. Maximum possible score = 16. NOTE: A low score indicates superior performance.

Mannequin - Puts together a puzzle containing 6 parts of the body: arms, legs, torso and head. Scoring: one point for each correctly placed body part. Maximum possible score = 5.

Frostig Test I (5- through 8-year-olds only) - Draws a line, keeping within the boundaries of two other lines. The first 9 items in this test were used.

Scoring: For items 1-4 and 6-8, 2 points were given if the line was within the boundaries and did not touch them. One point was given if the line touched the boundary but did not go outside of it.

Frostig Test V (5-through 8-year-olds only) - Copies a "Connect the Dots" pattern. The complete test of 8 items was administered. Scoring: one point for each pattern correctly copied. Maximum possible score = 8.

c. Tests of visual analysis. Of equal significance to classroom success is visual discrimination or visual analysis. At the moment of his first entry into the classroom demands are made upon the child to distinguish all kinds of differences in his environment, ranging from his teacher, his room, his coat, his cubby hole, and his materials to differences between words and sentences. Such ability to analyse develops sequentially from gross differentiation to finer differentiation. CREED personnel attempted to select tasks that reflect such a development of the ability to differentiate.

(1) Test Sources.

Matching Color Cubes - The Arthur Adaptation of the Leiter International Performance Scale.

Matching Forms - "Developmental Diagnosis" by A. Gesell, M.D. and C. Armatruda, M.D.

Seriation - Developed by CREED staff from commercial Montessori materials.

Gibson Transformations - Eleanor J. Gibson, Ph.D., Project Literacy Cornell University.

Visual Discrimination - Test developed by CREED personnel from commercial materials.

(2) Test Descriptions.

Visual Analysis - These tests measure the ability of the child to discriminate differences in various three dimensional objects, pictured objects and meaningless graphic forms.

Matching Color Cubes (3-through 4-year-olds only) - Matches 6 cubes to an array of vari-colored cubes. Scoring: Pass/Fail. Pass only if all 6 cubes correctly matched.

Matching Forms (3-through 4-year-olds only) - Places 6 simple geometric forms into the appropriate slots on a puzzle board. The board is presented twice; first with the figures appearing right side up, then with the board reversed. Scoring: Pass/Fail. Pass only if all figures correctly placed. One point for each of two presentations. Maximum possible score = 2.

Seriation (5-through 8-year-olds only) - Arranges by size gradations 10 wooden cylinders. Scoring: Pass/Fail. Pass only if all 10 cylinders arranged by size.

Gibson Transformations (5-through 8-year-olds only) - Finds all identical instances of a geometric nonsense figure from 13 possible choices. The test consists of 12 different nonsense figures, each with 13 choices. Scoring: one point for each correctly chosen figure; one point for each incorrectly chosen figure. The number incorrect was subtracted from the number correct and 150 was added to prevent negative scores. Maximum possible score = 169.

Visual Discrimination (5-through 8-year-olds only) - Matches 6 pictures to their 6 identical stimuli. Two series of stimuli were used, a moon face and a dog, requiring the child to make a total of 12 matches. Maximum possible score = 12.

d. Tests of conceptual ability. The end product of school instruction is the development of a person with a sophisticated level of cognitive functioning. The development has been studied more systematically than any of the other areas. Theorists, such as Bruner (1966), Vygotsky (1962) and, of course, Piaget (1952), have provided us with many insights into the phases of cognitive development. They have convinced us, for example, that a child must be able to consider more than one attribute of a concept at a time, to abstract rules about objects in the environment rather than to merely associate them in time or space, and to systematically order objects in his world. Classroom learning requires that the child know and use high level concepts, many of which he has never been formally taught. Instruction in mathematics, social studies and reading, all presume many requisite conceptual processes that the child, in effect, must teach himself. The skills defined by these theorists are crucial not only to the child's forming these concepts on his own, but also to his understanding of those presented in formal classroom instruction.

The tests were selected to measure concept ability at various levels of development: association, rule abstraction, sequential ordering.

(1) Test Sources.

DLM, See Quees - Tests developed by CREED personnel from commercial materials.

Concept Test - Vera John, Ph.D., Institute for Developmental Studies, New York University.

PSS - Lillian C.R. Restaino, Ph.D. and Toby Silverman-Dresner, Ph.D., Lexington School for the Deaf, Research Department.

(2) Test Descriptions.

Conceptualization - These tests measure the child's ability to utilize conceptual thinking at various levels of complexity.

Association Test - Given a stimulus item, child finds, from 4 possibilities, one item that is associated with the stimulus (e.g., spider and spider web). Scoring: number of items correctly chosen. Maximum possible score = 9.

DLM (3 through 4-year-olds); See Quees (5-through 8-year-olds) - Sequential ordering of pictures to make them tell a story. Scoring: one point for each card in a sequence correctly grouped. Where the total sequence was not correct partial credit was given of one point for any two cards in the correct consecutive order. Maximum possible score: DLM = 11; See Quees = 15.

Concept Test: Concept Score - Grouping of 16 different pictures on the basis of a unifying concept into 4 groups of 4 cards each. The concepts were men, means of transportation, dwellings and animals. Scoring: one point for each 2 cards correctly grouped; 3 points for each 3 cards correctly grouped; 4 points for each 4 cards correctly grouped; $\frac{1}{2}$ point subtracted for each card inappropriately placed in the above groupings. Maximum possible score = 16.

Concept Test: Association Score - A number of items were related in an associative level of conceptualization. Several of the 16 Concept Test cards could be grouped on the basis of their association with one another (e.g., farmer, farmhouse, cow, horse). This was not a separate test but was a second way of scoring the Concept Test. The assumption on the part of its creator, Vera John, is that the Association Score reflects lower level functioning. Scoring: one point for each card in an associative cluster. Maximum possible score = 12.

PSS (5-through 8-year-olds only) - Identifies the unifying concept for 3 pictures and finds a fourth instance of that concept from 4 possible choices. Scoring: number of items correctly chosen. Maximum possible score = 10.

e. Tests of attention and memory. This aspect of learning has been somewhat neglected in the literature. It is the assumption of the CREED staff, however, that in order to process any event in the environment, whether at a perceptual or cognitive level, the individual must learn to focus his attention on the event for a period of time. Many cognitive and perceptual psychologists believe that processes underlying such focusing are directly related to short-term and long-term memory (i.e., the mechanisms required to direct attention to an event are part of a sequence of mechanisms that result in the short-term and long-term memory processing of that event). Measures of these abilities, therefore, are crucial to the teacher, since impairment will affect the child's performance in all areas.

(1) Test Sources.

Knox Cubes - A Point Scale of Performance Tests by Grace Arthur, Ph.D.

Shell Game - Joan Godshalk, Educator of the Deaf.

Target Test - Reitan-Indiana Neuropsychological Test Battery for Children.

(2) Test Descriptions.

Attention and Memory - These tests measure the child's ability to direct his attention to a point in the environment. In addition, he is required to demonstrate short-term memory by the selection or reproduction of a response.

Knox Cubes - Remembers and reproduces a pattern tapped out on 4 cubes. The number of cubes tapped in one pattern increases from 2 through 8. If the child fails to reproduce a pattern, it is repeated and attempted a second time. Scoring: total number of patterns correctly reproduced on either the first or second trial. Maximum possible score = 18.

Shell Game (3-through 4-year-olds only) - Finds a bead hidden under one of three small boxes. The child must observe under which box the bead is initially placed and continue to watch that box through one, two or three changes in placement. Scoring: number of times the hidden bead was found. Maximum possible score = 3.

Target Test (5-through 8-year-olds only) - A pattern is tapped out on a 9-dot grid. Remembers and reproduces that pattern on an individual grid by drawing a line through all the dots of the pattern. Scoring: number of patterns correctly reproduced. Maximum possible score = 10.

3. Test Administration

Full day workshops were held for participating teachers in each of the twelve schools. At these workshops teachers were instructed in the use of the manual, the tests, and the rating scales. General instructions and those specific to each test in the battery were demonstrated. The teachers were given the opportunity to practice the administration of the tests. They were encouraged to pose questions at these sessions, and several modifications were made of the battery on the basis of their recommendations. Testing was carried out from late November of 1968 through March of 1969.

4. Behavioral Rating Scale

As stated above, the teachers were required to rate their children on affective dimensions of behavior. Many rating scales in current use were evaluated for their appropriateness to the purposes of the CREED project. It was thought that the Behavioral Rating Scale would prove most useful on the basis of the following: the range of behavioral dimensions, the comprehensive descriptions of each dimension provided the rater, and the relative simplicity of rating.

The dimensions to be rated were: Hyperactivity, Distractibility, Impulsivity, Unpredictability, Explosiveness, Lethargy and Emotional Disturbance.

The Behavioral Rating Scale was taken from the instrument devised through the collaboration of Sister Mary Patricia Finneran and Ralph W. Colvin, Ph.D.

5. Vision Screening Test

In response to the teacher's concern about the status of their children's vision, CREED personnel consulted Dr. Robert Bowers, of Teachers College, Columbia University. Dr. Bowers devised a series of tests to measure those visual factors that are most critical to successful classroom learning.

a. *Test sources*.

(1) Test for Far Visual Acuity -
A Flash Card Vision Test for Children, Lighthouse Low Vision Lens Service, New York Association for the Blind.

(2) Test for Near Visual Acuity -
Near-Vision Test for Children, Lighthouse Low Vision Lens Service, New York Association for the Blind.

(3) *Plus-Lens Test for Hyperopia*

(4) Test for Depth Perception -
Professional Vision Tester, Titmus Optical Co., Inc., Slide testing for depth perception presented at near and far point.

(5) Test for Muscle Imbalance -
Professional Vision Tester, Titmus Optical Co., Inc., Slide testing for muscle imbalance presented at near and far point.

(6) Test for Color Vision -
H-R-R Pseudoisochromatic Color Plates, Hardy, L.H., Rand, C., and Rittler, M.C., American Optical Co.

(7) Test for Peripheral Vision -
Schweigger Hand-Perimeter Test.

b. *Test descriptions*.

(1) Test for Far Visual Acuity.
Measures the child's ability to discriminate pictures of different sizes at 10- and 20-foot distances.

The symbols used in this test are an apple, an umbrella and a house. They are presented in flash card form, one picture on each card. The three symbols are repeated at each acuity level: 200, 100, 50, 40, 30 and 20. The symbol size ranges from 20 (.35 meters) to 200 (3.5 meters).

Scoring: the size of the symbol that the child is able to easily identify at a 20-foot distance and then at a 10-foot distance.

A score indicating unimpaired vision at both 10 feet and 20 feet is 20. Children who scored at a higher acuity level were suggested for referral.

(2) Test for Near Visual Acuity.
Measures the child's ability to discriminate pictures of various sizes at a forearm's distance. The stimuli are presented on a small card. The range of print size is from the small type of 5 pt. (.5 meters) to the larger type of 27+ pt. (6 meters).

The symbols are the same as those used in the Test for Far Visual Acuity.

Scoring: the size print at which the child is easily able to identify the printed symbols. The score indicates the size print that the child would be most comfortable reading. Since most children's readers are printed in 18 pt. type, children who scored higher than this were suggested for referral.

(3) Plus-Lens Test for Hyperopia.
With the use of convex lenses this test identifies the presence of hyperopia.

The child looks through the lenses at the acuity level 30 cards from a distance of 20 feet.

Scoring: Pass/Fail. Fail if the child is able to identify the stimulus figure through the convex lenses. A passing score indicates that the child is not farsighted.

The above tests were administered both with and without corrective lenses if the child wore them. They were also administered to both the right and left eyes individually and then to both eyes simultaneously.

(4) Test for Depth Perception.
Measures the child's ability to see objects in three dimensions. Looking into the instrument, a different picture is presented to each eye.

Scoring: Pass/Fail. Pass if the child communicates to the examiner that he sees one object superimposed upon the other. Muscle balance was tested at both near and far points.

(5) Test for Muscle Imbalance.
Measures the ability of the child's two eyes to operate simultaneously to see an object as one image. The right eye stimuli are two boxes, one red and one white ($\substack{\square \\ \square}$), vertically aligned. The left eye is presented with one white and one blue box vertically aligned ($\substack{\square \\ \square}$).

Scoring: Pass/Fail. Pass if the child communicates to the examiner that he sees three boxes (red, white and blue) in a vertical line.

This test was also administered at the near and far point settings.

(6) Test for Color Vision.
Measures deficiencies in the child's red-green and blue-yellow vision by means of imbedded circles, triangles and crosses.

Scoring: one point given for correctly tracing the figures on each of 6 screening plates. Maximum possible score = 6.

(7) Test for Peripheral Vision.
Determines the restrictions of the child's visual field. The instrument is held by the examiner. The child responds to the stimulus as soon as it comes within his field of vision.

Scoring: The point at which the child indicates he is able to see the stimulus is recorded in degrees, as read directly from the instrument. The test was administered on both the right and left sides.

The above tests were administered with corrective lenses if the child wore them.

c. Test population. The testing time for children 3 through 8 years averaged about 12 minutes. Because there were 975 children in the population, it became impossible to test all of them in the time period allotted the project. It was most important, however, to obtain information about the children's visual status; it was decided, therefore, to run an auxiliary group for this part of the project. Twenty-five children in each school were randomly selected for administration of the visual screening series.

6. Communication Competence.

Dr. Pauline Jenson, of Teachers College, consented to work closely with CREED personnel in evaluating communication skills. She devised special measures for the CREED project so that we might obtain information for the teachers about the relative competence of their children on various dimensions of communication. The description of this phase of the CREED project is discussed by Dr. Jenson in Chapter V.

B. Subjects

1. Selection Procedures

a. Designation of "Special" versus "Typical." The designation of a child as "Special" or "Typical" was made by each school on its own set of criteria. Since it was the function of the CREED 3 Project to describe for the schools involved the abilities of the children they so designate, we included in our sample of "Special" children all those so termed both by their teacher, and the supervisor who typically makes this decision. A further sub-group was identified in the children of rubella etiology, because educators expressed special interest in information about the disabilities reflected by this group.

b. Age range. We restricted the sample to those children between the ages of 3 through 8 years of age because we strongly believe that remediation will be successful only if it begins at the earliest stages. We included the very young child in the testing program, although we were well aware of the problems attendant upon such an undertaking. Because it is a critical age, systematic accumulation of information about performance must begin at this age level.

c. Sample size. In order to determine the extent of the deficiencies of the deaf child who is called "Special" in our schools, it was necessary to test all children in the New York State schools for the deaf between the ages of 3 through 8 years. It is most important to the success of curriculum development that we compare the performance of this child, who is "Special" and deaf, with that of his peers who are "typically deaf."

d. Behavioral dimensions. In order to describe "Special" children more precisely, we decided to describe the behavioral dimensions of the population. The results of the CREED 1 project indicated that two groups of children manifested special learning disabilities; one with perceptual-cognitive deficiencies and another with emotional deficiencies. The implications were clearly that children with learning problems have emotional difficulties and/or perceptual-cognitive difficulties. Thus, we requested that the teacher rate each of her children on several dimensions of behavior. We planned to compare the performance on all variables of children with emotional problems with those without such problems, whether they were "Special" or "Typical." In devising such subgroupings, it was our hope that we would increase the probability of more precise definition of sources of learning disorders.

2. Description of Final Sample

The final sample of children who participated in the testing program are described in Tables 2 through 5. The sample was divided into several groups in order to meet the objectives of the study. These groups are as follows:

a. By designation. The total population tested included 444 3-through 4-year-olds, 227 5-through 8-year-olds and 289 7- through 8-year-olds. Table 2 presents the mean ages of each age group. Table 3 presents the proportion of "Special" and "Typical" children involved in the study. Within the 3-through 4-year-old group, 112 were designated by their schools as "Special" and 332 as "Typical." For the 5-through 6-year-olds, 65 were "Special" and 162 were "Typical." Of the 7-through 8-year-olds, 86 were considered "Special" and 203 "Typical." The total number of "Special" children tested was 263, and the total number of "Typical" children was 697.

TABLE 2

Mean Age and Standard Deviation of Special and Typical Children

	Ages 3-4		Ages 5-6		Ages 7-8	
	Special	Typical	Special	Typical	Special	Typical
Mean Age	4 yrs.4 mos.	4 yrs.3 mos.	6 yrs.	5 yrs.11 mos.	8 yrs.1 mo.	8 yrs.1 mo.
S.D.	3.6 mos.	4.5 mos.	6.7 mos.	6.8 mos.	6.6 mos.	6.9 mos.

TABLE 3

Number and Percentages of Special and Typical Children in Testing Population in Three Age Groups

Population	Ages 3-4		Ages 5-6		Ages 7-8		Total	
	N	%	N	%	N	%	N	%
Special	112	25.22	65	28.63	86	29.76	263	27.40
Typical	332	74.78	162	71.37	203	70.24	697	72.60
Total	444		227		289		960	

TABLE 4

Number and Percentages of Rated High Behavior and Low Behavior Children in Testing Population in Three Age Groups

Population	Ages 3-4		Ages 5-6		Ages 7-8		Total	
	N	%	N	%	N	%	N	%
High Behavior	105	23.65	51	22.47	85	29.41	241	25.10
Low Behavior	339	76.35	176	77.53	204	70.59	719	74.90
Total	444		227		289		960	

TABLE 4A

Numbers of Special and Typical Children in High and Low Scoring Groups on the Behavioral Rating Scale

Population	Ages 3-4	Ages 5-6	Ages 7-8	Total
Special-High Behavior	48	32	42	122
Special-Low Behavior	64	33	44	141
Typical-High Behavior	57	19	43	119
Typical-Low Behavior	275	143	160	578
Total	444	227	289	960

TABLE 5

Number and Percentages of Rubella and Non-Rubella Children in Testing Population in Three Age Groups

Population	Ages 3-4		Ages 5-6		Ages 7-8		Total	
	N	%	N	%	N	%	N	%
Rubella	225	50.68	12	5.29	25	8.65	262	27.29
Non-Rubella	219	49.32	215	94.71	264	91.35	698	72.71
Total	444		227		289		960	

b. By behavioral rating scale score. The numbers of children rated "High" and "Low" on the Behavioral Rating Scale are presented, by age groups, in Table 4. For the 3-through 4-year-olds, 105 were in the "High" behavior group and 339 in the "Low" behavior group. Of the 5-through 6-year-olds, 51 were in the "High" behavior group and 176 were in the "Low" behavior group. Of the 7-through 8-year-olds, 85 were in the "High" behavior group and 204 were in the "Low" behavior group. The total number of children in the "High" behavior group was 241 and the total in the "Low" behavior group was 719.

Table 4A reports the numbers of children from the "Special" and "Typical" groups falling into the "High" and "Low" scoring groups on the Behavioral Rating Scale. The "Special" children fall about equally into both the "High" and "Low" scoring groups, at each age level. From 15-20% of the "Typical" group fall within the "High" scoring group.

c. By etiology. Table 5 presents the proportion of children at each age group with rubella and non-rubella etiologies. Of the 3-through 4-year-olds tested, 225 had a rubella etiology and 219 were of other etiologies. For the 5-through 6-year-olds, 12 were of rubella etiology and 215 were of other etiologies. Of the 7-through 8-year-olds, 25 were of rubella etiology and 264 were of other etiologies. The total number of children tested who had a rubella etiology was 262, and the total number with other etiologies was 698.

d. By school. Because so many schools of different sizes were participants in the study, the number of children contributed by each school to the general population was tabulated. These numbers were further analyzed according to designation, score on the Behavioral Rating Scale, and etiology. They are reported in Tables 6 through 9.

TABLE 6

Proportion of Total Population Contributed by Participating Schools

School	N	%
St. Joseph's School for the Deaf	137	14.27
Rochester School for the Deaf	105	10.93
Lexington School for the Deaf	73	7.60
Mill Neck Manor Lutheran School for the Deaf	80	8.33
St. Mary's School for the Deaf	85	8.86
New York State School for the Deaf	80	8.33
St. Francis de Sales School for the Deaf	67	6.98
Nassau Day Classes for Deaf Children	37	3.86
Catholic Charities Cleary School for Deaf Children	39	4.07
New York School for the Deaf	87	9.06
School for the Deaf, J.H.S. 47	170	17.71
Total	960	100.00

TABLE 7

Number and Percentages of Special and Typical Children in Participating Schools

School	Ages 3-4		Ages 5-6		Ages 7-8		Total	
	N	%	N	%	N	%	N	%
St. Joseph's								
Special	35	42.17	7	25.00	19	73.08	61	44.53
Typical	48	57.83	21	75.00	7	26.92	76	55.47
Total	83		28		26		137	
Rochester								
Special	7	15.56	2	8.70	8	21.62	17	16.19
Typical	38	84.44	21	91.30	29	78.38	88	83.81
Total	45		23		37		105	
Lexington								
Special	12	22.22	4	30.77	0	0.00	16	21.92
Typical	42	77.78	9	69.23	6	100.00	57	78.08
Total	54		13		6		73	
Mill Neck Manor								
Special	10	24.39	6	37.50	2	8.70	18	22.50
Typical	31	75.61	10	62.50	21	91.30	62	77.50
Total	41		16		23		80	
St. Mary's								
Special	2	8.00	7	31.82	11	28.95	20	23.53
Typical	23	92.00	15	68.18	27	71.05	65	76.47
Total	25		22		38		85	
N.Y.S. School								
Special	3	6.25	1	5.00	3	11.11	7	8.75
Typical	30	93.75	19	95.00	24	88.89	73	91.25
Total	33		20		27		80	
St. Francis de Sales								
Special	13	40.63	3	16.67	3	17.65	19	28.36
Typical	19	59.38	15	83.33	14	82.35	48	71.64
Total	32		18		17		67	
Nassau Day Classes								
Special	1	5.56	3	33.33	2	20.00	6	16.22
Typical	17	94.44	6	66.67	8	80.00	31	83.78
Total	18		9		10		37	

(continued)

TABLE 7 (continued)

School	Ages 3-4		Ages 5-6		Ages 7-8		Total	
	N	%	N	%	N	%	N	%
Catholic Charities Cleary School								
Special	10	30.30	0	0.00	0	0.00	10	25.64
Typical	23	69.70	5	100.00	1	100.00	29	74.36
Total	33		5		1		39	
New York School								
Special	1	3.57	7	20.59	1	4.00	9	10.34
Typical	27	96.43	27	79.41	24	96.00	78	89.66
Total	28		34		25		87	
J.H.S. 47								
Special	18	34.62	25	64.10	37	46.84	80	47.06
Typical	34	65.38	14	35.90	42	53.16	90	52.94
Total	52		39		79		170	

TABLE 8

Number and Percentages of Children with High and Low Ratings on the Behavioral Rating Scale

School	Ages 3-4		Ages 5-6		Ages 7-8		Total	
	N	%	N	%	N	%	N	%
St. Joseph's								
High	22	26.51	6	21.43	10	38.46	38	27.74
Low	61	73.49	22	78.57	16	61.54	99	72.26
Total	83		28		26		137	
Rochester								
High	16	35.56	3	13.04	14	37.84	33	31.43
Low	29	64.44	20	86.96	23	62.16	72	68.57
Total	45		23		37		105	
Lexington								
High	13	24.07	5	38.46	1	16.67	19	26.03
Low	41	75.93	8	61.54	5	83.33	54	73.97
Total	54		13		6		73	
Mill Neck Manor								
High	11	26.83	4	25.00	7	30.43	22	27.50
Low	30	73.17	12	75.00	16	69.57	58	72.50
Total	41		16		23		80	
St. Mary's								
High	2	8.00	4	18.18	15	39.47	21	24.71
Low	23	92.00	18	81.82	23	60.53	64	75.29
Total	25		22		38		85	
New York State School								
High	5	15.15	1	5.00	7	25.93	13	16.25
Low	28	84.85	19	95.00	20	74.07	67	83.75
Total	33		20		27		80	
St. Francis de Sales								
High	3	9.38	1	5.56	3	17.65	7	10.45
Low	29	90.63	17	94.44	14	82.35	60	89.55
Total	32		18		17		67	
Nassau Day Classes								
High	4	22.22	4	44.44	4	40.00	12	32.43
Low	14	77.78	5	55.56	6	60.00	25	67.57
Total	18		9		10		37	

(continued)

TABLE 8 (continued)

School	Ages 3-4		Ages 5-6		Ages 7-8		Total	
	N	%	N	%	N	%	N	%
Catholic Charities Cleary School								
High	11	33.33	0	0.00	0	0.00	11	28.21
Low	22	66.67	5	100.00	1	100.00	28	71.79
Total	33		5		1		39	
New York School								
High	7	25.00	13	38.24	8	32.00	28	32.18
Low	21	75.00	21	61.76	17	68.00	59	67.82
Total	28		34		25		87	
J.H.S. 47								
High	11	21.15	10	25.64	16	20.25	37	21.76
Low	41	78.85	29	74.36	63	79.75	133	78.24
Total	52		39		79		170	

TABLE 9

Number and Percentage of Rubella and Non-Rubella Children In Participating Schools

School	Ages 3-4		Ages 5-6		Ages 7-8		Total	
	N	%	N	%	N	%	N	%
St. Joseph's								
Rubella	38	45.78	2	7.14	0	0.00	40	29.20
Non-Rubella	45	54.22	26	92.86	26	100.00	97	70.80
Total	83		28		26		137	
Rochester								
Rubella	20	44.44	0	0.00	8	21.62	28	26.67
Non-Rubella	25	55.56	23	100.00	29	78.38	77	73.33
Total	45		23		37		105	
Lexington								
Rubella	32	59.26	0	0.00	0	0.00	32	43.84
Non-Rubella	22	40.74	13	100.00	6	100.00	41	56.16
Total	54		13		6		73	
Mill Neck Manor								
Rubella	25	60.98	0	0.00	3	13.04	28	35.00
Non-Rubella	16	39.02	16	100.00	20	86.96	52	65.00
Total	41		16		23		80	
St. Mary's								
Rubella	9	36.00	0	0.00	2	5.26	11	12.94
Non-Rubella	16	64.00	22	100.00	36	94.74	74	87.06
Total	25		22		38		85	
New York State School								
Rubella	12	34.38	2	10.00	2	7.41	16	20.00
Non-Rubella	21	65.63	18	90.00	25	92.59	64	80.00
Total	33		20		27		80	
St. Francis de Sales								
Rubella	14	43.75	0	0.00	3	17.65	17	25.37
Non-Rubella	18	56.25	18	100.00	14	82.35	50	74.63
Total	32		18		17		67	
Nassau Day Classes								
Rubella	9	50.00	2	22.22	1	10.00	12	32.43
Non-Rubella	9	50.00	7	77.78	9	90.00	25	67.57
Total	18		9		10		37	

(continued)

TABLE 9 (continued)

School	Ages 3-4		Ages 5-6		Ages 7-8		Total	
	N	%	N	%	N	%	N	%
Catholic Charities								
Cleary School								
Rubella	33	100.00	1	20.00	0	0.00	34	87.18
Non-Rubella	0	0.00	4	80.00	1	100.00	5	12.82
Total	33		5		1		39	
New York School								
Rubella	14	50.00	4	11.76	1	4.00	19	21.84
Non-Rubella	14	50.00	30	88.24	24	96.00	68	78.16
Total	28		34		25		87	
J.H.S. 47								
Rubella	19	36.54	1	2.56	5	6.33	25	14.71
Non-Rubella	33	63.46	38	97.44	74	93.67	145	85.29
Total	52		39		79		170	

CHAPTER III

Results

A. CREED 3 Battery

The performance of the children on the test battery is described through the following comparisons:

- --differences in scores as a function of the designation "Special" or "Typical"
- --differences in scores as a function of rating on the Behavioral Rating Scale
- --differences in scores as a function of age
- --differences in scores of children with suspected rubella etiology and other etiologies

The test battery was analyzed further to obtain information about the relationship of the individual tests to one another. The analyses performed to obtain this information included:

- --analyses of variance of each test with two-way classification of "Special"-"Typical" designation and "High"-"Low" behavior rating for three age groups
- --separate factor analyses of the scores of "Special" and "Typical" children for three age groups
- --comparison of means at age intervals of one year, separately for "Special" and "Typical" children
- --correlations of tests with age
- --analyses of variance with one-way classification of rubella/non-rubella for three age groups
- --reliabilities of the individual tests

1. Comparison of "Special" vs. "Typical" Children

a. Analyses of variance. Tables 10 to 12 present the results of the analyses of variance at each of three age levels, based upon the "Special"-"Typical" designation.

(1) 3-through 4-year-olds. It may be seen in Table 10 that for the 3-through 4-year-old group six of the 12 tests discriminated between "Special" and "Typical" children. Significant F values were found in measures of Gross Motor Behavior, Attention and Memory (Knox Cubes), Sensory-Motor Integration (Mannequin, Form-Copying),

TABLE 10

Means, Standard Deviations and F Values
for Special vs. Typical Children of 3-4 Years of Age

Test	Special (N=112)		Typical (N=332)		F
	Mean	S.D.	Mean	S.D.	
Gross Motor	3.00	1.31	3.66	1.17	15.79**
VMI	4.72	1.89	5.20	1.58	3.22
Knox Cubes	1.78	2.22	3.32	2.84	13.84**
Mannequin	4.27	1.44	4.66	1.04	4.07*
Concept Test - Concept Score	5.26	6.06	5.46	5.79	.01
Concept Test - Association Score	2.04	2.31	2.25	2.22	.76
Association Test	3.92	2.95	4.98	2.78	4.89*
Form Copying	13.47	2.96	12.02	3.47	7.40**
DLM	2.18	2.30	2.40	2.25	.27
Shell Game	1.74	1.13	1.92	1.10	1.63
Matching Color Cubes	.79	.40	.91	.29	8.65**
Matching Forms	1.83	.46	1.85	.43	.04

$*F_{.05}=3.86$

$**F_{.01}=6.70$

TABLE 11

Means, Standard Deviations and F Values
for Special vs. Typical Children of 5-6 Years of Age

Test	Special (N=65)		Typical (N=162)		F
	Mean	S.D.	Mean	S.D.	
Gross Motor	4.17	1.61	4.92	1.53	7.25**
VMI	5.74	1.18	6.32	.83	10.77**
Knox Cubes	4.78	3.08	7.32	3.58	8.89**
Mannequin	4.88	.67	4.90	.60	.39
Concept Test - Concept Score	5.27	4.98	7.12	5.29	2.96
Concept Test - Association Score	3.25	2.86	3.91	2.56	.49
Association Test	5.72	3.04	7.64	1.77	22.48**
Form Copying	7.03	3.69	4.76	3.19	10.79**
See Quees	3.31	2.77	4.85	3.87	1.64
Target Test	4.60	2.98	7.01	2.69	21.45**
PSS	4.26	1.91	5.57	2.15	11.26**
Frostig I	3.85	2.61	4.98	2.47	2.77
Frostig V	2.28	2.01	3.96	2.16	14.08**
Gibson Transformations	128.60	45.94	140.46	22.39	2.47
Visual Discrimination	5.05	3.00	6.68	2.93	6.72*
Seriation	.22	.41	.36	.48	1.68

*$F_{.05}=3.86$

**$F_{.01}=6.70$

TABLE 12

Means and Standard Deviations and F Values
for Special vs. Typical Children of 7-8 Years of Age

Test	Special (N=86)		Typical (N=203)		F
	Mean	S.D.	Mean	S.D.	
Gross Motor	5.35	1.51	6.14	1.15	17.97**
VMI	5.58	.71	5.83	.48	7.55**
Knox Cubes	7.43	4.34	10.66	3.60	32.32**
Mannequin	4.88	.44	4.95	.41	2.19
Concept Test - Concept Score	7.05	5.61	6.95	5.84	.001
Concept Test - Association Score	4.65	2.90	5.89	3.04	6.92**
Association Test	7.66	2.29	8.63	1.25	17.41**
Form Copying	4.53	3.44	2.14	2.14	39.09**
See Quees	5.65	4.22	9.07	4.50	25.97**
Target Test	7.23	2.88	8.60	1.94	21.83**
PSS	5.55	2.24	6.83	1.99	19.80**
Frostig I	6.26	2.71	6.69	2.54	.71
Frostig V	4.93	1.91	6.13	1.25	32.87**
Gibson Transformations	136.74	35.51	154.20	11.16	34.86**
Visual Discrimination	6.92	3.00	8.45	2.65	15.99**
Seriation	.42	.49	.80	.40	33.08**

$F_{.05}=3.86$
$**F_{.01}=6.70$

Visual Analysis (Matching Colors) and Conceptualization (Association Test). No significant differences were found for the five items of the VMI test. Inspection of the percentages of responses by item (Appendix Table A) shows that on three of the six items, viz., Building-a-Tower, Beading and Peg Board, both groups performed somewhat similarly. Larger differences were found in Thumb Touching, Scissors Cutting and Buttoning.

On the DLM, a measure of sequential ordering, similarity of mean scores is apparently a function of the difficulty of the task; very few of the children were capable of sequencing. The Shell Game, a measure of attention and memory, was apparently too easy for this group. When comparing the results of this measure with those of another measure of attention and memory, Knox Cubes, it becomes obvious that the latter is far superior as a source of discrimination.

The mean scores of the Concept Test were quite similar. This may have been the result of both the difficulty and the ambiguity of the task. The equally high levels of performance on the Matching Forms test indicate that this ability is mastered at a younger age level.

In summary, the difference between the groups at this age level seem to be in the area of Gross Motor Behavior, Attention and Memory, Sensory-Motor Integration, Visual Analysis, and Conceptualization.

(2) 5-through 6-year-olds. Inspection of Table 11 reveals that significant differences were found in nine of the 16 measures administered at this age level. Significant F values were found in tests of Gross Motor Behavior, Sensory-Motor Integration (VMI, Form Copying, Frostig V), Attention and Memory (Knox Cubes, Target Test), Visual Analysis (Visual Discrimination) and Conceptualization (Association Test, PSS).

Large differences were found in Sensory-Motor Integration tasks, including the VMI test, Frostig V and Form Copying. Inspection of Appendix Table B shows that large differences were found in the percentages of correct responses to the VMI test items of Building-A-Tower and Pegboard. In those tests measuring Attention and Memory (Knox Cubes, Target Test) large differences were found between the two groups.

"Typical" children performed significantly better than "Special" children on the Association Test and the PSS, both measures of cognition. Measures on which both groups performed similarly include the Mannequin test See Quees, Frostig I, Gibson Transformations and Seriation.

The deficiency demonstrated by the 3-through 4-year-old "Special" children on the Mannequin test does not appear in the performance of the older children. The Concept Test-Concept Score failed to discriminate between the "Special" and "Typical" children at any age level; the Concept Test-Association Score discriminated only between the 7-through 8-year-olds. Apparently "Special" and "Typical" children at all age levels, except the very oldest, perform equally well on this measure. Again, this may be a function of the difficulty of the task. The "Special" children fell behind the "Typical" on skills necessary to master the sub-tests of the VMI at the older age level, while all 3-through 4-year-olds were at equal levels of proficiency.

Performance of the groups on the Gibson Transformations does not differ; this similarity, however, may be a function of the difficulty of the task for all groups. Doubtless, this explains the failure of the Seriation and See Quees test to discriminate between the groups (i.e., the tests are equally as difficult for all deaf children at this age level). When one studies the extraordinarily large differences between the groups on these measures (Gibson Transformations, Seriation, See Quees), at the 7-through 8-year-old level, it becomes clear that while the "Typical" 5-through 6-year-olds do not master these skills at this time, they do so one year later. Their "Special" peers do not.

In summary, the "Special" children of 5-6 years of age perform at a lower level than their "Typical" peers on measures of Gross Motor Behavior, Sensory-Motor Integration, Attention and Memory, Visual Analysis and Conceptualization.

(3) 7-through 8-year-olds. Table 12 presents data for the 7 through 8-year-old group. On 12 of the 16 tests the "Typical" children performed at a significantly higher level than the "Special" children. These differences were found in Gross Motor Behavior, Sensory-Motor Integration (VMI, Frostig V, Form Copying), Visual Analysis (Gibson Transformations, Seriation, Visual Discrimination) and Conceptualization (Concept Test-Association Score, Association Test, PSS, See Quees).

There were no significant differences on the Mannequin, Concept Test-Concept Score and Frostig I. As with the 5-through 6-year-olds, the "Special" children perform less well than do the "Typical" on the Frostig V (reproducing patterns by connecting dots) although they do as well on the Frostig I (drawing a line within two borders). Similarly, as with the 5-through 6-year-olds, the Mannequin and the Concept Test-Concept Score fail to discriminate between "Special" and "Typical" children.

In summary, although the "Special" 7-through 8-year-olds were different from their "Typical" peers on all tests that differentiated the 5-through 6-year-olds, they also performed at significantly lower levels on four additional measures, viz., Association Test, See Quees, Gibson Transformations and Seriation.

b. Factor Analyses. Tables 13 through 18 report the results of the factor analyses run separately for each of the six groups. Only those loadings of .40 and above were considered in the factor descriptions; i.e., those tests that correlated at .40 and above with a factor.

(1) 3-through 4-year-olds. Table 13 reports the four factors extracted from correlations of scores for the "Special" children of 3-4 years of age. Each factor describes the variation in performance shared in common by the tests listed for that factor, i.e., children who were at the lower levels on one test tended to be at the lower levels on all tests listed for that factor, and children who scored high on one test tended to score high on all tests listed for that factor.

Factor One includes tests of Attention and Memory, Sensory-Motor Integration and Conceptualization. Thus, children who were deficient in Attention and Memory tended to be deficient in Sensory-Motor Integration and in Conceptualization. Indeed, 40% of the variation of this group is accounted for by this factor.

The remaining factors are more uni-dimensional. Factor Two is a Sensory-Motor factor. All four tests loading on this factor involve some aspect of Visual-Motor Integration. The tests apparently are discriminating variation in Sensory-Motor abilities other than those found in Factor One. In other words, this group of children varies

TABLE 13

Factor Loadings of .40 and Over:
Special Children of 3-4 Years of Age

Factors			
1	2	3	4
Gross Motor (.46)	VMI (.55)	Communication 1 (.88)	Behavior Rating (-.77)
VMI (.57)	Mannequin (.73)	Communication 2 (.88)	Auditory Rating (.78)
Knox Cubes (.71)	Matching Colors (.59)		
Concept Test-Concept Score (.67)	Matching Forms (.77)		
Concept Test-Assoc. Score (.67)			
Association (.68)			
Form Copying (-.74)			
DLM (.64)			
Shell Game (.52)			

TABLE 14

Factor Loadings of .40 and Over:
Typical Children of 3-4 Years of Age

Factors							
1		2		3		4	
VMI	(.41)	Gross Motor	(.49)	Concept Test-Concept Score	(.77)	Communication 1	(.75)
Mannequin	(.67)	VMI	(.58)	Concept Test-Assoc. Score	(.82)	Communication 2	(.75)
Matching Colors	(.67)	Knox Cubes	(.69)	DLM	(.60)	Auditory Rating	(.44)
Matching Forms	(.71)	Association	(.47)			Shell Game	(.47)
		Form Copying	(-.80)				
		Behavior Rating	(-.41)				

TABLE 15

Factor Loadings of .40 and Over:
Special Children of 5-6 Years of Age

Factors							
1		2		3		4	
VMI	(.47)	Gross Motor	(.45)	Mannequin	(-.81)	Communication 1	(.73)
Knox Cubes	(.59)	VMI	(.49)	Gibson Transformations	(.84)	Communication 2	(.79)
Concept Test-Assoc. Score	(.62)	Concept Test-Concept Score	(.72)			PSS	(.47)
Association	(.66)	Visual Discrim.	(.59)			Behavior Rating	(-.40)
Form Copying	(-.64)	Behavior Rating	(-.44)				
See Quees	(.57)	Auditory Rating	(.46)				
Target Test	(.70)						
PSS	(.48)						
Frostig I	(.56)						
Frostig V	(.78)						
Seriation	(.61)						
Auditory Rating	(-.41)						

TABLE 16

Factor Loadings of .40 and Over:
Typical Children of 5-6 Years of Age

Factors							
1		2		3		4	
Gross Motor	(.44)	Communication 1	(.81)	See Quees	(.60)	Mannequin	(-.46)
VMI	(.51)	Communication 2	(.76)	Gibson Transformations	(.52)	Concept Test-Concept Score	(.68)
Knox Cubes	(.61)	Gross Motor	(.43)	Visual Discrimination	(.67)	Concept Test-Assoc. Score	(-.49)
Association	(.51)			Seriation	(.74)		
Form Copying	(-.75)						
Target Test	(.67)						
PSS	(.46)						
Frostig I	(.61)						
Frostig V	(.73)						
Auditory Rating	(-.40)						

TABLE 17

Factor Loadings of .40 and Over:
Special Children of 7-8 Years of Age

Factors			
1	2	3	4
Knox Cubes (.59)	Communication 1 (.78)	Concept Test-Concept Score (.77)	Gross Motor (.70)
Association (.65)	Communication 2 (.83)	Concept Test-Assoc. Score (-.70)	VMI (.50)
Form Copying (-.55)	Auditory Rating (.72)	Seriation (.52)	Mannequin (.50)
See Quees (.71)			Behavior Rating (-.68)
Target Test (.76)			
PSS (.69)			
Frostig V (.76)			
Gibson Transformations (.69)			
Visual Discrimination (.48)			
Seriation (.60)			
Concept Test-Assoc. Score (.47)			

TABLE 18

Factor Loadings of .40 and Over:
Typical Children of 7-8 Years of Age

Factors							
1		2		3		4	
Gross Motor	(.50)	Communication 1	(.76)	Concept Test-Concept Score	(-.90)	VMI	(.69)
Knox Cubes	(.66)	Communication 2	(.77)	Concept Test-Assoc. Score	(.86)	Form Copying	(-.44)
Form Copying	(-.42)	Auditory Rating	(.81)			Seriation	(.49)
See Quees	(.62)					Behavior Rating	(-.56)
Target Test	(.40)						
PSS	(.56)						
Frostig I	(.45)						
Frostig V	(.61)						
Gibson Transformations	(.57)						
Visual Discrimination	(.61)						
Seriation	(.43)						

on Sensory-Motor abilities related to Conceptualization and and Attention, as in Factor One, and in a second dimension of Sensory-Motor abilities, as found in Factor Two.

Communication has been clearly isolated for this group in Factor Three on the two scales measuring that ability.

Factor Four seems to have isolated a behavioral dimension in the group; it is quite possible that here the Auditory Rating Scale is reflecting the child's behavior rather than his hearing.

Table 14 reports the loadings for the "Typical" 3-through 4-year-olds. The factor structures for this group are very similar to that of their "Special" peers. Although Factors One and Two are reversed, again the greater amount of variation in the group is accounted for by the compound factor (in this case Factor Two) involving Sensory-Motor Integration, Attention and Memory, and Conceptualization. Similarly, a secondary Sensory-Motor Integration factor was extracted for this group (here Factor One).

A third factor was extracted that is clearly Conceptualization, and the fourth factor is the Communication dimension.

In summary, the test battery has isolated three factors in common for the two groups at this age level. The compound factor identifies an ability that underlies success in Attention and Memory, Sensory-Motor Integration and Conceptualization for children in both groups (i.e., this basic ability describes both "Special" and "Typical" children at this age level).

Communication and Sensory-Motor Integration factors were also isolated for both groups. Thus, though there are differences in the level of performance on the tests between the groups (as seen in the analyses of variance), the structure of abilities is similar for both groups.

Table 15 describes the factor structure for the "Special" children of 5-6 years of age.

Factor One is the compound factor identified for "Special" and "Typical" groups at all ages.

Factor Two is apparently a secondary compound factor (i.e., two abilities have been isolated that account for differences in the level of success in these tests). While Factor One includes tests of Visual-Motor Integration, Conceptualization and Attention, Factor Two includes tests of Visual-Motor Integration, Conceptualization and Behavior.

Factor Three is quite difficult to interpret. The Gibson is a strong measure of Visual Analysis, but again the strange inverse relationship of the Mannequin defies interpretation.

The very high loadings of the Communication Scales on Factor Four classifies it as the Communication factor for this group.

(2) 5-through 6-year-olds. Table 16 reports the factor structure for the "Typical" 5-through 6-year-olds. Again, we see the compound factor identifying an ability common to success in Attention and Memory, Sensory-Motor Integration and Conceptualization.

Factor Two is obviously the Communication factor.

Factor Three identifies an ability that involves both Visual Analysis and Conceptualization. Since both these skills are strongly dependent upon the visual analysis of attributes, we may presume that it is this factor that is being described here.

Factor Four is not easily interpreted. It may be termed a Conceptualization factor, although the Concept Test-Concept Score and Concept Test-Association Score are really dimensions of the same measure. The presence of the negative loading for the Mannequin is more difficult to explain.

In summary, the Test Battery identifies for both groups at this age a compound factor similar to that found for their younger peers. Again, the "Special" 5-through 6-year-olds, when compared with the "Typical," performed at significantly lower levels on tests loading on this factor. However, while they differ in level, the structure of this ability is basically the same.

The only other factor held in common by this group is that isolated by the Communication Scales; the remaining factors extracted for both groups are not readily comparable. Variation among the "Special" children is found in a second compound factor that includes behavior as an added dimension. The two remaining factors isolated for the "Typical" group reflect their variation in cognitive rather than sensory-motor abilities.

(3) 7-through 8-year-olds. The factor structures for the 7-through 8-year-olds of both groups are so similar that they will be discussed together (see Tables 17 and 18).

Factor One is the compound factor found in all groups.

Factor Two is the Communication factor.

Factor Three is an independent Cognitive factor. Apparently the requirements of the Concept Test involve abilities different from those demanded for the other measures of Conceptualization, which are part of the compound factor.

Factor Four is an independent Sensory-Motor Integration factor, in each case involving Behavior as an additional dimension.

In summary, the factor structures for "Special" and "Typical" children in this age group bear closer resemblance to one another than do the others.

The instruments comprising the Test Battery were selected to measure specific aspects of Attention and Memory, Sensory-Motor Integration and Conceptualization; thus, it was expected that tests selected as measures of the same ability would load on the same factor. While in most cases we do find them loading on the same factor, apparently many of them are related to a more fundamental ability identified as the "compound factor" for all age groups.

2. Comparisons of Children Rated "High" and "Low" on the Behavioral Rating Scale

Tables 19 through 21 report the results of the analyses of variance at each of three age levels based upon "High and "Low" ratings on the Behavioral Rating Scale. "High" designation was assigned to the child who scored above the mean for his group; "Low" designation was assigned to the child scoring at the mean and below for his age group. "High" on the Behavioral Rating Scale describes a child who was rated by his teacher as frequently manifesting such behavioral characteristics as hyperactivity, distractibility, unpredictability, etc. "Low" on the Behavioral Rating Scale describes a child who rarely manifested such behavior.

a. 3-through 4-year-olds. Inspection of Tables 19 through 21 reveals that at all age levels differences reflect a lower level of performance on the part of the children rated "High." Table 19 indicates that for the 3-through 4-year-olds, 6 of the 12 tests discriminated between "High" and "Low" rated children. Differences were found on Gross Motor Behavior, VMI, Knox Cubes and the Mannequin. Five of these 6 tests were also significantly different in the "Special"-"Typical" comparisons. Apparently, there is some

TABLE 19

Means, Standard Deviations and F Values for Groups with High and Low Ratings on the Behavioral Rating Scale (3-4 Years)

Test	High Behavior Rating (N=105)		Low Behavior Rating (N=339)		F
	Mean	S.D.	Mean	S.D.	
Gross Motor	3.12	1.34	3.61	1.19	5.19*
VMI	4.58	1.89	5.24	1.58	8.66**
Knox Cubes	1.93	2.43	3.24	2.81	7.70**
Mannequin	4.18	1.57	4.68	.99	9.15**
Concept Test - Concept Score	4.76	5.61	5.61	5.93	1.34
Concept Test - Association Score	1.93	2.24	2.28	2.25	2.22
Association Test	3.87	2.78	4.98	2.85	5.83*
Form Copying	13.33	3.06	12.09	3.47	4.09*
DLM	2.15	2.31	2.41	2.26	.47
Shell Game	1.72	1.16	1.93	1.10	1.97
Matching Color Cubes	.86	.35	.88	.32	.00
Matching Forms	1.78	.52	1.86	.41	3.21

*$F_{.05}=3.86$

**$F_{.01}=6.70$

TABLE 20

Means, Standard Deviations and F Values for Groups with High and Low Ratings on the Behavioral Rating Scale (5-6 Years)

Test	High Behavior Rating (N=51)		Low Behavior Rating (N=176)		F
	Mean	S.D.	Mean	S.D.	
Gross Motor	4.12	1.66	4.88	1.54	3.72
VMI	5.76	1.21	6.27	.88	3.29
Knox Cubes	4.63	3.01	7.16	3.61	8.18**
Mannequin	4.90	.70	4.89	.60	.05
Concept Test - Concept Score	4.85	5.00	7.09	5.27	3.62
Concept Test - Association Score	3.37	2.76	3.82	2.65	.16
Association Test	6.06	3.02	7.39	2.08	2.34
Form Copying	6.65	3.78	5.05	3.34	1.48
See Quees	2.92	2.18	4.84	3.89	5.65*
Target Test	5.12	3.10	6.66	2.87	1.46
PSS	4.24	2.14	5.48	2.11	4.96*
Frostig I	4.04	2.22	4.84	2.64	.62
Frostig V	2.47	2.06	3.77	2.23	3.26
Gibson Transformations	129.55	46.73	139.24	25.30	.95
Visual Discrimination	5.51	3.06	6.42	3.02	.18
Seriation	.24	.43	.35	.48	.44

$^{*}F_{.05}=3.86$

$^{**}F_{.01}=6.70$

TABLE 21

Means, Standard Deviations and F Values for Groups with High and Low Ratings on the Behavioral Rating Scale (7-8 Years)

Test	High Behavior Rating (N=85)		Low Behavior Rating (N=204)		F
	Mean	S.D.	Mean	S.D.	
Gross Motor	5.54	1.48	6.06	1.21	4.11*
VMI	5.64	.65	5.81	.52	1.83
Knox Cubes	8.92	4.22	10.02	4.04	.03
Mannequin	4.93	.37	4.93	.44	.008
Concept Test - Concept Score	6.93	5.88	7.00	5.75	.07
Concept Test - Association Score	4.89	3.12	5.78	3.00	2.12
Association Test	7.86	2.32	8.54	1.30	5.71*
Form Copying	3.76	3.34	2.47	2.49	3.88*
See Quees	6.93	5.04	8.52	4.47	.92
Target Test	7.88	2.68	8.32	2.19	.30
PSS	6.07	2.48	6.61	1.99	.67
Frostig I	5.82	2.54	6.87	2.58	10.30**
Frostig V	5.34	1.81	5.96	1.44	2.95
Gibson Transformations	140.72	35.78	152.46	13.38	9.90**
Visual Discrimination	7.41	3.35	8.24	2.59	2.00
Seriation	.59	.50	.72	.45	.02

$*F_{.05}=3.86$

$**F_{.01}=6.70$

overlap between children at this young age rated "High" on the Behavioral Rating Scale and those designated as "Special."

b. 5-through 6-year-olds. Table 20 reports the results of the analyses of variance for the 5-through 6-year-olds. Only 3 of the 16 tests discriminated between the "High" and "Low" groups. Differences were found on Knox Cubes, See Quees and PSS. In our comparisons of the "Special" and "Typical" 5-through 6-year-olds, it was found that 9 of the 16 tests discriminated between the groups. Thus, with the older children it seems that those designated as "Special" comprise a somewhat different group than those rated as "High" on the Behavioral Rating Scale.

c. 7-through 8-year-olds. Table 21 reports the results of the analyses of variance for the 7-through 8-year-olds. Five of the 16 tests discriminated between "High" and "Low" rated children, viz., Gross Motor Behavior, Association Test, Form Copying, Frostig I and Gibson Transformations. In our comparisons of the "Special" and "Typical" children, 12 of the 16 tests discriminated between the groups. Again, it would seem that the children rated "High" are not the same ones designated as "Special" children at this age level.

Children rated as "High" on the Behavioral Rating Scale did indeed perform less well than those rated "Low" in several instances. However, such performances do not reflect the consistent patterns found in the "Special"-"Typical" comparisons. In addition, there were only two significant interactions in all the analyses of variance, i.e., there was no indication that children who are rated "High" and designated as "Special" perform differently from those who are "Low"-"Special." In other words, most of the variation in performance is accounted for by the "Special"-"Typical" dichotomization. On the other hand, differences are found in performance between the "High"-"Low" rated children. These differences are based upon the Behavioral dimension alone, across "Special" and "Typical" groups; i.e., the variation is based upon the Behavior Rating group in which the child falls, not any interaction between Behavior Rating and designation as "Special."

3. Comparisons by Age

a. Significant Tests of Means at Adjacent Age Levels for "Special" and "Typical" Groups. Tables 22 and 23 report separately for "Special" and "Typical" children the means, standard deviations and t-tests, for adjacent age groups. No data are reported for the "Special" 3-year-olds vs. "Special" 4-year-olds because of the obvious disparity in sample size.

It becomes immediately apparent that the performance of the "Typical" children reflects a more consistent increase in score as a function of increases in age than does the performance of the "Special" children. The most dramatic differences are found at the oldest age level; while the "Special" 8-year-olds increase in score beyond their 7-year-old peers on only 2 tests, the "Typical" children show such increases on 9 tests. The "Typical" 4-year-olds increase beyond the 3-year-olds on 9 tests. The tables indicate that the greatest increases for both "Special" and "Typical" children occur in the 6-year-old group. They achieve significant score increases over the 5-year-olds on 11 tests for the "Typical" group and 9 for the "Special" group.

The increments in scores for both "Special" and "Typical" groups are found in most tests - Gross Motor Coordination, Sensory-Motor Integration, Memory and Attention, and Conceptualization.

TABLE 22

Means, Standard Deviations and t Tests
for Adjacent Age Groups
(Special Children)

Test	4 Years (N=104)		5 Years (N=32)		t
	Mean	S.D.	Mean	S.D.	
Knox Cubes	1.91	2.26	4.00	2.51	-4.44**
Mannequin	4.27	1.46	4.84	.88	-2.11*
Concept Test - Concept Score	5.54	6.10	5.33	5.86	.17
Concept Test - Association Score	2.17	2.34	2.19	2.10	-.03
Association Test	4.12	2.96	4.81	3.16	-1.13
Form Copying	13.47	2.74	8.19	4.12	8.39**

*$t_{.05}=2.04$

**$t_{.01}=2.75$

(continued)

TABLE 22 (continued)

Test	5 Years (N=32)		6 Years (N=33)		t
	Mean	S.D.	Mean	S.D.	
Gross Motor	4.19	1.73	4.15	1.54	.09
VMI	5.41	1.19	6.06	1.12	-2.29*
Knox Cubes	4.00	2.51	5.55	3.46	-2.05*
Mannequin	4.84	.88	4.91	.38	- .39
Concept Test - Concept Score	5.33	5.86	5.21	4.13	.09
Concept Test - Association Score	2.19	2.10	4.27	3.18	-3.11**
Association Test	4.81	3.16	6.61	2.75	-2.44*
Form Copying	8.19	4.12	5.91	2.93	2.58*
See Quees	2.66	2.87	3.94	2.61	-1.89
Target Test	3.81	2.98	5.36	2.87	-2.14*
PSS	3.78	2.07	4.73	1.66	-2.03*
Frostig I	3.06	2.33	4.61	2.73	-2.45*
Frostig V	1.31	1.73	3.21	1.87	-4.25**
Gibson Transformations	136.66	49.00	120.79	42.80	1.39
Visual Discrimination	4.97	3.10	5.12	3.00	- .20
Seriation	.12	.34	.30	.47	-1.76

(continued)

*$t_{.05}$=2.04

**$t_{.01}$=2.75

TABLE 22 (continued)

Test	6 Years (N=33)		7 Years (N=27)		t
	Mean	S.D.	Mean	S.D.	
Gross Motor	4.15	1.54	5.30	1.61	-2.80**
VMI	6.06	1.12	5.33	8.32	2.80**
Knox Cubes	5.54	3.46	7.15	4.45	-1.57
Mannequin	4.91	.38	4.81	.56	.77
Concept Test - Concept Score	5.21	4.13	6.28	6.04	- .81
Concept Test - Association Score	4.27	3.18	4.44	3.26	- .21
Association Test	6.61	2.75	7.44	2.82	-1.16
Form Copying	5.91	2.93	5.41	3.70	.59
See Quees	3.94	2.61	5.44	4.30	-1.67
Target Test	5.36	2.87	7.00	3.30	-2.05*
PSS	4.73	1.66	5.00	2.91	- .46
Frostig I	4.61	2.73	5.18	2.42	- .86
Frostig V	3.21	1.87	4.52	1.99	-2.62*
Gibson Transformations	120.79	42.80	127.30	53.60	- .52
Visual Discrimination	5.12	3.00	6.44	3.47	-1.59
Seriation	.30	.47	.37	.49	- .54

*$t_{.05}$=2.05

**$t_{.01}$=2.77

(continued)

TABLE 22 (continued)

Test	7 Years (N=27)		8 Years (N=59)		t
	Mean	S.D.	Mean	S.D.	
Gross Motor	5.30	1.61	5.37	1.48	- .22
VMI	5.33	.83	5.69	.62	-2.24*
Knox Cubes	7.15	4.45	7.56	4.36	- .40
Mannequin	4.81	.56	4.91	.38	- .97
Concept Test - Concept Score	6.28	6.04	7.41	5.47	- .86
Concept Test - Association Score	4.44	3.26	4.75	2.78	- .44
Association Test	7.44	2.82	7.76	2.04	- .59
Form Copying	5.41	3.70	4.14	3.29	1.60
See Quees	5.44	4.30	5.75	4.25	- .30
Target Test	7.00	3.30	7.34	2.72	- .50
PSS	5.00	2.91	5.80	1.85	-1.53
Frostig I	5.19	2.42	6.75	2.74	-2.54*
Frostig V	4.52	1.99	5.12	1.88	-1.35
Gibson Transformations	127.30	53.60	141.07	22.84	-1.68
Visual Discrimination	6.44	3.47	7.14	2.79	- .99
Seriation	.37	.49	.44	.50	- .61

*$t_{.05}$=2.05

**$t_{.01}$=2.77

TABLE 23

Means, Standard Deviations and t Tests
for Adjacent Age Groups
(Typical Children)

Test	3 Years (N=58)		4 Years (N=274)		t
	Mean	S.D.	Mean	S.D.	
Gross Motor	3.10	1.10	3.78	1.15	-4.07**
VMI	4.17	1.88	5.42	1.42	-5.73**
Knox Cubes	2.03	2.44	3.59	2.85	3.88**
Mannequin	4.21	1.54	4.76	.88	-3.72**
Concept Test - Concept Score	4.03	5.50	5.76	5.82	-2.09*
Concept Test - Association Score	1.74	2.07	2.36	2.24	-1.93
Association Test	3.26	2.45	5.35	2.72	-5.39**
Form Copying	13.55	2.98	11.69	3.49	-3.78**
DLM	1.55	1.62	2.59	2.33	-3.22**
Shell Game	1.84	1.06	1.94	1.12	- .60
Matching Color Cubes	.79	.41	.93	.25	-3.32**
Matching Forms	1.79	.52	1.86	.41	1.04

*$t_{.05}$=2.00
**$t_{.01}$=2.66

(continued)

TABLE 23 (continued)

Test	4 Years (N=274)		5 Years (N=87)		t
	Mean	S.D.	Mean	S.D.	
Knox Cubes	3.59	2.85	6.47	3.58	-7.69**
Mannequin	4.76	.88	4.93	.33	-1.78
Concept Test - Concept Score	5.76	5.82	6.90	5.27	-1.62
Concept Test - Association Score	2.36	2.24	3.34	2.53	-3.47**
Association Test	5.35	2.72	7.40	1.93	-6.53**
Form Copying	11.69	3.49	5.52	3.17	14.69**

(continued)

$*t_{.05}=1.99$

$**t_{.01}=2.63$

TABLE 23 (continued)

Test	5 Years (N=87)		6 Years (N=75)		t
	Mean	S.D.	Mean	S.D.	
Gross Motor	4.46	1.33	5.45	1.59	-4.34**
VMI	6.25	.82	6.40	.84	-1.12
Knox Cubes	6.47	3.58	8.31	3.36	-3.35**
Mannequin	4.93	.33	4.87	.81	.68
Concept Test - Concept Score	6.90	5.27	7.38	5.38	- .58
Concept Test - Association Score	3.34	2.53	4.57	2.47	-3.12**
Association Test	7.40	1.93	7.92	1.55	-1.86
Form Copying	5.52	3.17	3.88	3.02	3.35**
See Quees	3.97	3.09	5.88	4.43	-3.22**
Target Test	6.25	2.91	7.88	2.13	-4.00**
PSS	5.03	2.17	6.20	1.99	-3.54**
Frostig I	4.23	2.36	5.85	2.34	-4.38**
Frostig V	3.23	2.10	4.80	1.93	-4.93**
Gibson Transformations	135.69	24.73	146.00	18.15	-2.98**
Visual Discrimination	6.17	2.97	7.28	2.80	-2.43*
Seriation	.33	.47	.40	.49	- .88

*$t_{.05}$=1.99

**$t_{.01}$=2.64

(continued)

TABLE 23 (continued)

Test	6 Years (N=75)		7 Years (N=70)		t
	Mean	S.D.	Mean	S.D.	
Gross Motor	5.45	1.59	5.81	1.25	-1.51
VMI	6.40	.84	5.87	.51	4.55**
Knox Cubes	8.31	3.36	9.31	3.52	-1.76
Mannequin	4.87	.81	4.97	.24	-1.04
Concept Test - Concept Score	7.38	5.38	6.68	5.86	.75
Concept Test - Association Score	4.57	2.47	5.94	2.98	-3.02**
Association Test	7.92	1.55	8.36	1.72	-1.61
Form Copying	3.88	3.02	2.49	2.13	3.19**
See Quees	5.88	4.43	7.66	4.49	-2.40*
Target Test	7.88	2.13	8.09	2.38	- .55
PSS	6.20	1.99	6.54	1.97	-1.04
Frostig I	5.85	2.34	6.07	2.57	- .54
Frostig V	4.80	1.93	5.73	1.56	-3.17**
Gibson Transformations	146.00	18.15	150.94	15.32	-1.77
Visual Discrimination	7.28	2.80	7.83	2.63	-1.21
Seriation	.40	.49	.70	.46	-3.78**

*$t_{.05}$=2.00
**$t_{.01}$=2.65

(continued)

TABLE 23 (continued)

Test	7 Years (N=70)		8 Years (N=133)		t
	Mean	S.D.	Mean	S.D.	
Gross Motor	5.81	1.25	6.32	1.05	-3.01**
VMI	5.87	.51	5.81	.46	.84
Knox Cubes	9.31	3.52	11.36	3.47	-3.98**
Mannequin	4.97	.24	4.94	.47	.52
Concept Test - Concept Score	6.68	5.86	7.09	5.86	- .48
Concept Test - Association Score	5.94	2.98	5.86	3.10	.17
Association Test	8.36	1.72	8.77	.90	-2.24*
Form Copying	2.49	2.13	1.95	2.14	1.68
See Quees	7.66	4.49	9.81	4.35	-3.32**
Target Test	8.09	2.38	8.87	1.62	-2.78**
PSS	6.54	1.97	6.98	2.00	-1.50
Frostig I	6.07	2.57	7.02	2.48	-2.56*
Frostig V	5.73	1.56	6.35	1.00	-3.42**
Gibson Transformations	150.94	15.32	155.92	7.76	-3.07**
Visual Discrimination	7.83	2.63	8.78	2.63	-2.46*
Seriation	.70	.46	.85	.36	-2.55*

*$t_{.05}$=2.00

**$t_{.01}$=2.65

One area of disparity is in tests of Visual Analysis; in no instance was there any significant increase with age on these tests for the "Special" children.

In summary, the "Special" children do not perform at higher levels, as a function of increasing age, on the tests in the CREED 3 battery with the consistency found in the "Typical" children.

b. Correlations Between Test Battery and Age. Table 24 reports the correlation of the battery of tests with age-in-months within each of the age groups. There is indication of a relationship within the youngest group of "Special" children and age on the VMI items, and age and the Association Test.

The relationship between age-in-months for the "Typical" group of 3-through 4-year-olds is stronger; Gross Motor Behavior, VMI, Knox Cubes, Form Copying and the Association Test are all apparently related to age differences.

Both 5-through 6-year-old groups demonstrate a relationship between age and Target Test, Frostig I and V and Form Copying. In addition, for "Special" children, two cognitive measures (Concept Test-Association Score, Association Test) are related to age, and for the "Typical" children, Gross Motor Behavior and Knox Cubes are related to age.

The data for "Special" and "Typical" 7-through 8-year-olds are somewhat more ambiguous; while the mean scores of the "Typical" 7-year-olds differed from the mean scores of the "Typical" 8-year-olds in 10 out of 16 tests, the "Special" 7-year-olds differed in only 2 of the 16 tests (Tables 22 and 23). The correlational data, however, are very similar for both "Special" and "Typical" children when both age groups are combined. Apparently, while there are significant differences between the means at adjacent age levels,

TABLE 24

Correlations Between Tests and Age for
Special and Typical Children at
Three Age Groups

Test	Ages 3-4		Ages 5-6		Ages 7-8	
	Special	Typical	Special	Typical	Special	Typical
Gross Motor	.15	.32	-.006	.32	.06	.14
VMI	.39	.39	.24	.11	.18	-.10
Knox Cubes	.23	.31	.22	.33	.08	.29
Mannequin	.02	.20	.15	-.08	.13	-.06
Concept Test - Concept Score	.13	.14	-.12	-.01	.02	.07
Concept Test - Association Score	.21	.11	.35	.24	.14	-.06
Association Test	.33	.35	.31	.26	.20	.08
Form Copying	-.18	-.33	-.32	-.32	-.15	-.12
DLM	.18	.15				
Shell Game	.06	.03				
Matching Color Cubes	.16	.13				
Matching Forms	.15	.04				
See Quees			.23	.25	.11	.21
Target Test			.40	.31	.06	.19
PSS			.26	.26	.13	.09
Frostig I			.40	.32	.26	.16
Frostig V			.51	.39	.16	.25
Gibson Transformations			-.21	.17	.21	.19
Visual Discrimination			.09	.17	.06	.13
Seriation			.27	.13	.11	.17

the variation _within_ each age group is not so great as to result in high correlations when both 7-year-olds and 8-year-olds are grouped together.

A serious limitation in the correlational data is the fact that the planned age comparisons were made over too short an age span. It is now clear that more meaningful information would have been obtained had the correlations been computed over the entire age range (3 years through 8 years) and over 3-year age ranges (3-5 years, 6-8 years).

4. _Comparison of Children with Rubella Etiology vs. Others_

Table 25 reports the differences in performance of 3-through 4-year-old children with suspected rubella etiology and those with deafness attributed to other causes.

In 11 of the 16 tests, no differences in performance are found. In the 5 tests in which there were significant F values, the rubella children performed on a level superior to that of the non-rubella group. This superiority was demonstrated on tests of Attention (_Shell Game_), Sensory Motor Integration (_Mannequin_) and Conceptualization (_Concept Test_).

5. _Reliabilities_

A test battery is as valuable as the reliabilities of its individual tests. While the results mentioned above indicate clear differences among the different groups, if the instruments themselves are unreliable, further comment is unwarranted. The reliabilities for the standardized tests used as part of the battery are presented in the manuals for these tests; the reliabilities for the new tests are presented in Table 26.

TABLE 25

Means, Standard Deviations and F Values for
Rubella vs. Non-Rubella Children of 3-4 Years of Age

Test	Rubella (N=225)		Non-Rubella (N=219)		F
	Mean	S.D.	Mean	S.D.	
Gross Motor	3.42	1.10	3.57	1.36	1.49
VMI	5.09	1.60	5.07	1.75	.02
Knox Cubes	3.04	2.78	2.83	2.77	.60
Mannequin	4.71	.94	4.42	1.35	6.93**
Concept Test - Concept Score	6.04	5.86	4.77	5.78	5.26*
Concept Test - Association Score	2.47	2.24	1.92	2.22	6.59*
Association Test	4.97	2.85	4.45	2.86	3.62
Form Copying	12.39	3.23	12.37	3.58	.002
DLM	2.49	2.37	2.20	2.15	1.84
Shell Game	1.98	1.08	1.77	1.14	3.98*
Matching Color Cubes	.89	.31	.86	.34	.95
Matching Forms	1.85	.43	1.84	.45	.10

$^{*}F_{.05}=3.86$
$^{**}F_{.01}=6.70$

TABLE 26

Reliabilities of Non-Standardized Tests
Included in the CREED 3 Test Battery

Test	Ages 3-4		Ages 5-6		Ages 7-8	
	Special	Typical	Special	Typical	Special	Typical
Gross Motor	.64	.60	.62	.65	.65	.52
VMI	.74	.66	.45	.25	.40	.25
Association Test	.84	.80	.87	.72	.88	.89
Target Test			.86	.82	.86	.77
PSS			.42	.59	.66	.63
Visual Discrimination			.86	.82	.82	.77

Most of the reliabilities indicate that the test scores are quite stable. The lower reliabilities at the 5-through 8-year-old level for the VMI and at the 5-through 6-year-old level for the PSS are apparently a reflection of the change in difficulty level as a function of increasing age. The VMI is consistently easy for the older children and the PSS is consistently difficult for the younger children. All reliabilities are sufficiently high, however, in conjunction with the large samples, to permit us to accept the results as indicative of genuine differences between the age groups.

B. Visual Screening

The results to be reported for the Visual Screening tests do not include all tests at all age levels. It became clear after testing several 3- and 4-year-olds, that the visual screening instruments currently available are inappropriate for use with deaf children at these ages. "Typical" children in this age group could be successfully tested only with the tests for Far Acuity, Near Acuity, Farsightedness, and Color Blindness. The instructions were not sufficiently demonstrative for most "Special" children. Of 3-through 4-year-olds tested, it was decided by the three CREED examiners present that only four children understood the task sufficiently to permit inclusion of their scores on the above tests.

We report results for all 3-through 4-year-olds only to afford an *approximation* of the extent of their visual abilities. Until modifications are made of the instruments for this group, their scores must be considered with great caution. The scores for the older children, however, may be considered reliable descriptions of their visual abilities.

In order to evaluate the differences, if any, in the vision of "Special" and "Typical" children, analyses of variance were computed; these are reported in Table 27. To obtain information about the relationship between visual status and the areas covered by the Test Battery for "Special" and "Typical" children, correlations were computed between scores on the Visual Screening tests and scores on the Test Battery, separately for each group. These are reported in Tables 28, 29 and 30.

1. Analyses of Variance

In Table 27 there are no indications of a consistent pattern of differences at the 5-through 6-year-old level. Near Acuity does differentiate the groups, but "Special" children scored higher. On the other hand, the 7-through 8-year-old "Typical" children do better than the "Special" children at this age on the Far Acuity, Near Acuity and Perimeter tests.

2. Correlations

Tables 28 and 29 report the correlations over .30 for the "Special" 5-through 6-year-olds and the "Special" 7-through 8-year-olds. No correlations are reported for the 3-through 4-year-olds "Special" group because only four children were successfully tested with the available instruments.

In Table 28 for the 5-through 6-year-olds, Near Acuity positively correlates with most tests of the battery; however, the lower the score on this test, the more acute the vision for near objects. Thus, one would presume that negative correlations would result. This is the case for the 7-through 8-year-olds (Table 29).

The positive correlations of the PSS with Far and Near Acuity are similarly difficult to interpret; again, a higher score on the visual tests denotes poorer vision. One would expect, therefore, negative correlations. The Target Test, however, does correlate appropriately with the Perimeter and Muscle Balance tests, and Frostig I with the Perimeter, Muscle Balance, and Farsightedness tests.

Table 29 reports the correlations for the 7-through 8-year-old "Special" children. As noted, Near Acuity correlates appropriately with 3 of the tests. Of added interest is the increased number of tests of the battery that correlate with the Perimeter Test, a measure of peripheral vision. Looking across the rows, the Gibson Transformations test correlates with 5 of the measures of vision.

The results of the tests for the 7-through 8-year-olds are somewhat more predictable than those for the 5-through 6-year-olds. This may reflect an instability of the instruments in their present form for "Special" children, even at the 5-6-year level.

One critical difference between "Special" and "Typical" children must be noted, viz., the standard deviations of the "Special" children are consistently larger than those for the "Typical" children (Table 27). Consideration of these standard deviations and inspection of individual tests demonstrates that, while there may not be any consistent mean differences, more "Special" children demonstrated poor vision on these tests than did "Typical" children.

Under the constraints imposed by the small sample, the results indicate that no consistent pattern of visual disabilities was demonstrated for "Special" children, as compared with "Typical" children. There did appear, however, to be a more consistent relationship for "Special" children between successful performance on tests in the battery and on the Visual Screening tests.

TABLE 27

Means, Standard Deviations and F Values of Vision Screening Battery for Special vs. Typical Children at Three Age Levels

Examination	Ages 3-4 (N=444)			Ages 5-6 (N=227)			Ages 7-8 (N=289)		
	Mean	S.D.	F	Mean	S.D.	F	Mean	S.D.	F
Far Acuity 20 feet									
Special	20.00	12.25	2.14	34.38	44.44	2.02	28.57	17.54	4.80[4]
Typical	25.31	5.58		24.63	12.13		22.54	6.10	
Far Acuity 10 feet									
Special	15.00	8.66	8.60[1]	24.38	22.07	1.32	24.28	17.06	2.66
Typical	20.31	1.74		20.74	3.25		20.36	2.67	
Near Acuity									
Special	4.75	2.86	.27	4.50	1.77	5.44[2]	6.05	3.29	4.55[4]
Typical	5.81	3.84		5.15	.52		5.07	.37	
Farsightedness									
Special	.75	.43	.45	.81	.39	1.76	.86	.35	.42
Typical	.88	.33		.92	.26		.91	.29	
Perimeter-Left Eye									
Special	Not Administered			Not Administered			67.86	27.50	3.81
Typical							78.91	19.16	
Perimeter-Right Eye									
Special	Not Administered			Not Administered			68.33	26.87	3.65
Typical							79.09	19.28	

(continued)

TABLE 27 (continued)

Examination	Ages 3-4 (N=444)			Ages 5-6 (N=227)			Ages 7-8 (N=289)		
	Mean	S.D.	F	Mean	S.D.	F	Mean	S.D.	F
Muscle Balance-Near									
Special	Not Administered			.31	.46	7.75^3	.62	.48	-1.17
Typical				.68	.46		.74	.44	
Muscle Balance-Far									
Special	Not Administered			.62	.48	5.16^2	.91	.29	.00
Typical				.87	.34		.91	.29	

[1] $F_{.01}=7.39$
[2] $F_{.05}=3.96$

[3] $F_{.01}=6.96$
[4] $F_{.05}=3.98$

NOTE: Ages 3-4 (Special N=4)
(Typical N=32)

Ages 5-6 (Special N=16)
(Typical N=54)

Ages 7-8 (Special N=21)
(Typical N=55)

TABLE 28

Correlations Between Visual Screening Tests and
Test Battery for Special Children
of 5-6 Years of Age

Test	Acuity 20 Feet	Acuity 10 Feet	Near Acuity	Farsightedness	Perimeter Left Eye	Perimeter Right Eye	Muscle Balance-Near	Muscle Balance-Far
Gross Motor			.64	.44				
VMI							.30	
Knox Cubes			.47					
Concept Test-Concept Score			.35					
Concept Test-Association Score			.47					.35
Association Test			.56					
Form Copying				.39			-.34	
See Quees			.60					.35
Target Test			.45		.37	.35		.51
PSS	.33	.38	.63	.40			.37	.40
Frostig I			.60	.44	.33	.32	.33	.42
Frostig V			.43				.32	.49
Gibson Transformations			.50	.35				
Visual Discrimination			.33	.41			.32	
Seriation			.32				.37	.37

TABLE 29

Correlations Between Visual Screening Tests and Test Battery for Special Children of 7-8 Years of Age

Test	Acuity 20 Feet	Acuity 10 Feet	Near Acuity	Farsightedness	Perimeter Left Eye	Perimeter Right Eye	Muscle Balance-Near	Muscle Balance-Far
Gross Motor					.50	.53		
VMI			-.65		.61	.62		
Knox Cubes	.34	.34						
Association Test								.54
Form Copying					-.32	-.35		
See Quees				-.40				
Target Test	-.37		-.35					.47
PSS					.33			
Frostig I					.32	.47		
Frostig V					.34			
Gibson Transformations	-.33	-.40	-.40		.38	.36		
Seriation					.42	.34	-.31	

TABLE 30

Correlations Between Visual Screening Tests and
Test Battery for Typical Children
at Three Age Levels

Test	Age Level	Acuity 20 Feet	Near Acuity	Farsight-edness	Perimeter Left Eye	Perimeter Right Eye	Muscle Balance-Far
Gross Motor	3-4			-.33			
Association Test	3-4		-.38				
Shell Game	3-4			.40			
Knox Cubes	3-4	-.41	-.38				
Visual Discrimination	5-6						.35
Knox Cubes	5-6					.38	
Gross Motor	7-8		-.42				
Form Copying	7-8		.49				
See Quees	7-8		-.36				
Gibson Transformations	7-8				.48	.47	

CHAPTER IV

Discussion and Recommendations

A. Discussion

It was the intention of the CREED 3 Project to describe the performance of those children that educators in New York State schools for the deaf are designating as "Special." In order to provide information that would prove more productive than that currently available in the literature, the tests were developed to meet objectives of both the classroom teacher and the developmental psychologist. It was the expectation of CREED personnel that the development and use of remediation procedures would be greatly facilitated if the tests were constructed according to the expressed goals of the classroom teacher. Similarly, it was decided that no test battery could be devised for a 3-through 8-year age range without modification in the selection procedure of the tests to account for developmental change.

Thus, the CREED 3 Test Battery includes tasks measuring Gross-Motor Coordination, Sensory Motor Behavior, Visual Analysis, Attention and Memory, and Conceptualization; i.e., all those abilities defined as significant _to_ teachers _by_ teachers. In addition, an attempt was made by the test constructors to select instruments that would discriminate among children as a function of increasing age. In other words, it was the expectation of the CREED staff that the CREED 3 Test Battery would not only differentiate children on the basis of special learning disorders, but also on the basis of age.

1. Special Children

An evaluation of the results indicated that the Test Battery successfully differentiated between those deaf children termed

"Special" and those termed "Typical." At each of the three age levels, significant differences in performance were found on subtests in all five areas. It would seem then that educationally relevant tests can be used to differentiate the deaf child with special learning disabilities from his typically deaf peer.

It became readily apparent that some tests were superior to others in making such differentiation at each age level. As had been hypothesized in the selection of the tests, some were more powerful discriminators as a direct function of age level. Gross-Motor tests discriminated quite consistently across all age ranges, while varying Sensory-Motor, Conceptualization and Sequencing tests increased in discriminating power with the increasing age of the child. This increase in discrimination at the upper age ranges is a most striking confirmation of the "cumulative deficit" about which we hear so much in the literature. Academic demands made upon the youngest child are not so clearly defined, and thus his deficits do not reveal themselves. As academic task requirements become more specific, the "Special" child begins to demonstrate his deficiencies, and with increasing age he falls further and further behind the achieving "Typical" deaf child.

Evaluation of the factor structure of their abilities, as reflected in their test scores, reveals that while their performance is depressed, it is not "bizarre" or "unpredictable." Ability factor structures were quite similar for both groups; thus the implication is that, while the "Special" deaf child may be having difficulty in moving ahead to the performance levels of his "Typical" peer, in the areas covered by the Test Battery he is not a totally different organism.

The relationships among the skill areas are the same for both groups. There was a compound factor found for both groups, most probably a reflection of the rule abstraction ability (i.e., the ability to consider and reject hypotheses) that is required for success on tasks ranging from gross visual discrimination through complex cognitive behavior.

Thus, the results indicate quite clearly that the Test Battery successfully describes differences in the performance of "Special" deaf children and "Typical" deaf children at the three age levels. There is also convincing evidence that it describes differences within the "Typical" and "Special" groups, as a function of age. In other words, the children in each of the groups, "Special" and "Typical," perform differently on the tests at each age level. These differences are more pronounced at all age levels for the "Typical" groups than for the "Special," i.e., the gap between the scores is wider with increasing age for the "Typical" group. The "Special" children, as a function of the "cumulative deficit" mentioned above, do not differ as markedly at varying age levels; however, there were increments in the performance within the "Special" group as a function of increasing age on Form-Copying, VMI, Frostig I and Frostig V.

In summary, it seems quite clear that the CREED 3 Project staff has successfully mastered the problem set before it, viz., the development and trial of a series of tasks that differentiate deaf children with special learning disabilities. It must be recognized, however, that the CREED 3 Project was basically a pilot phase of test development procedure. Standardization and norming procedures were not possible within the short duration of the project. Thus, the teacher may now compare her child's performance with mean scores of both "Special" and "Typical" children, but the data in this report are by no means normative data. The mean score differences, reliabilities, item analyses and construct validity are indeed quite respectable, and such comparisons will provide her with important information. A far more productive use of such promising data, however, would be the application of standardization procedures.

2. Affective Behavior

Evaluation of the data based upon the dichotomization of the sample of children on the basis of scores on the Behavioral Rating Scale (measuring dimensions of affective behavior) revealed that there are genuine differences between children who are perceived as different in terms of learning disabilities (i.e., "Special") and those perceived as different in terms of emotional problems. This differentiation, however, is very conspicuously dependent upon the age of the child. When the 5-through 8-year-olds were compared on the basis of their scores on the Rating Scale, there was a very sharp decrease in the number of significant mean differences between the "High" and "Low" scores on the Test Battery. On the basis of such results, it is readily apparent that the criteria that school personnel are using to arrive at the designation of "Special" are other than emotional behavior characteristics. In addition, children with emotional problems at this age level were not merely a sub-set of the "Special" children; i.e., the group of "Special" children were evenly distributed among those with and without emotional problems (see Tables 19-21). It would seem that the result of this even distribution of the "Special" children throughout the "High" and "Low" scoring groups was the dramatic decrease in differences in test performance.

These results indicate that the children designated as "Special" are, for the most part, those who are exhibiting learning problems rather than emotional problems. A report by McCarthy and Paraskevopoulos (1969) indicates that teachers do, indeed, tend to differentiate children with emotional problems from those with learning problems; the results of this project are a further confirmation of their findings.

The data for 3- through 4-year-olds is less promising; the criteria upon which the designation "Special" is based for 3- through 4-year-olds are obviously less clear. Since the score differences between "Special" and "Typical" children and "High" and "Low" scorers are about the same, we must conclude that school personnel find it more difficult to differentiate children with learning disabilities from those with emotional difficulties at this age. One reason for such difficulty is probably the fact that few really academic demands are made upon the child at this age as mentioned above; thus, the opportunities are few for school personnel to base any decision about classroom learning disabilities.

This makes our remediation task very difficult. If we state that we must begin with the 3-year-olds to prevent the cumulative deficit, then we must identify the likely prospects for special help at an early age. It is apparent that the tests of the CREED battery are sensitive to differences at the older age levels; for the very young child, however, the areas must be further analyzed so that tests of subordinate abilities prerequisite to those in the Test Battery, may be developed. Only with tests with increased sensitivity will we be able to separate the very young with incipient school learning difficulties from those with emotional problems. Meanwhile, we shall have to apply remedial activities to those children at this age who are performing poorly as a result of emotional problems as well as those with cognitive-perceptual disorders.

3. Rubella

Much has been written about the rubella "syndrome." Educators in schools for the deaf, however, indicated that the rubella children they have confronted fall along a continuum of learning disabilities. According to their observations, such children do not manifest a consistent pattern of disorder. The test results confirm these statements. Deaf children with a suspected rubella etiology did not differ from other deaf children. Where there were differences, in attention and distractibility, the non-rubella children in this group were more deficient.

One serious restriction on this interpretation, however, is the necessary selectivity exercised by all schools. Schools for the deaf in New York State are not equipped to handle the really seriously multi-handicapped child; many such children do fall within the rubella etiology group. These children, of course, do not appear in this sample. Thus, we must modify our results by stating that rubella etiology children currently attending New York State schools for the deaf do not differ from other children in these schools.

4. Visual Screening

Because of limitations on time, the Visual Screening Program fell short of the original plan. The program did, however, provide sufficient data to indicate that visual screening is critical to a program of academic remediation.

Although "Special" children were not consistently more deficient than "Typical" children on the visual tests, there was a stronger relationship for them between achievement and visual deficits. The implication here is that the visual defect is more detrimental to the achievement of the "Special" child than to the "Typical" child. Apparently, the "Typical" child with visual problems is compensating for his defects far more successfully than is the "Special" child.

Successful performance on these vision tests is prerequisite to success in any visual motor activity; it would seem, then, that such a screening program must become an integral part of any diagnostic procedure.

B. Recommendations

On the basis of the results of the CREED 3 Project, the project staff strongly recommends that:

1) research efforts be directed toward the analysis of the areas covered in the CREED 3 Test Battery into hierarchies of subskills. Such analysis will provide information both for test development at the 3- through 4-year-old level and for the sequential planning of remedial procedures;
2) research efforts be directed toward the development of a visual screening program appropriate for the valid measurement of the young deaf child. Several of the tests that could not be used in this study, because of difficulties in understanding instructions, might well have produced most significant information. Until instructions are designed

that are more appropriate to the age level and handicap of young deaf children, we will be missing a genuinely useful source of help for the design and application of remediation procedures;

3) those who construct tests for use with school children involve teachers in test development. Such involvement will increase the relevance of the tests for the classroom teacher and, consequently, increase its usefulness through ease of interpretation and application. An attempt was made to involve teachers in all phases of this project, from goal setting and test selection through test administration and evaluation of the final battery. Modifications were made at all phases as a result of the recommendations made by the teachers. In addition, general evaluations were encouraged at the conclusion of the study; after consideration of these evaluations further modifications will be made, where feasible. The staff believes that these modifications increase the value of the test for the designer, the teacher and the child. Samples of the final evaluations may be found in Appendix D.

A statement should be made here about the teacher as test administrator. Most research psychologists, the CREED 3 Staff among them, are concerned about the introduction of bias in the administration of tests to children by their teachers. After completion of the study, it is the belief of the CREED Staff that with recognition of the goal of helping children, by all personnel involved, such bias is greatly reduced. Certainly, the training and practice sessions were instrumental in achieving this goal, but of equal importance was the fact that teachers worked without the pressure of insidious comparison with others; the attention of all was directed toward the description of the reality of the individual special child;

4) those who develop tests become resources of remedial procedures for the deficits isolated by their tests. If they are to provide genuine help for teachers, then test developers must direct their attention to all phases of diagnostic teaching. It would seem a far more efficient use of time and effort if those who design diagnostic instruments, at the very least, communicated with those who design remediation procedures. An attempt was made to do this in CREED 3. CREED personnel held a series of three seminars for their staff and participating teachers to which three educational specialists were invited: Dr. Ray Barsch, of the University of Southern Connecticut; Dr. Margaret Jo Shepherd, of Teachers College, Columbia University; and Dr. Gloria Wolinsky, of Hunter College of the City University of New York. These specialists considered, with the CREED Staff and the teachers, the results of the testing program and recommended remedial procedures appropriate to the deficits found. Transcriptions of these seminars were made for future consultation (CREED 3, 1969).

In addition, CREED 3 will be followed by CREED 4, in which there will be a systematic investigation of remedial procedures with "Special" children.

CHAPTER V

Evaluation of Communication Behaviors

Pauline M. Jenson, Ph.D.

The communication scales developed for the CREED 3 study are the Pupil-Teacher Communication Scale and the Auditory Behavioral Rating Scale. The scales were designed to be incorporated into the over-all research design, which offered an opportunity to look at successive age groups of deaf children from three to nine years in two behavioral classifications: "Typical" and "Special." Further comparisons were made between rubella and non-rubella groups in the 3-through 4-year-old age group, and between groups with "High" and "Low" incidence of negative behaviors.

The conditions under which the total study was executed determined the thrust of the communication scales. Examiners were classroom teachers, reflecting a variety of professional preparations, and, consequently, differing degrees of formal knowledge of communication theory, assessment, and interpretation. The test environment was the classroom, and, on a larger scale, a variety of schools for the deaf, differing in specific communication goals and methodologies for their attainment.

Since an earlier study (CREED 1) included use of the Watson and Pickles Language Scales (Ewing, 1957), and a ten-point auditory rating scale developed by CREED personnel, it seemed appropriate to pursue and expand the earlier probes. The Watson and Pickles Scales focus on selected oral behaviors. The scales developed for this study examine a broader range of communication behaviors, since goals were (1) discrimination of normal and deviant patterns; and

(2) acquisition of further information on the emergence of oral linguistic competency in deaf children.

The Pupil-Teacher Communication Scale

The Pupil-Teacher Communication Scale is an instrument for estimating the deaf child's growth toward linguistic competency. Assessment involves: 1) observation of the child's spontaneous communication with his classroom teacher, and 2) notation of his primary communication mode, as well as one or more supportive modes in order of their frequency. (See Appendix E.)

The 19 items of the scale are based on the literature in communication and education of the hearing impaired, as well as the investigator's observations as classroom teacher and supervisor of student teaching with deaf children. To determine the scale's reliability, the items were scrambled and submitted to three communication specialists for ranking. Extent of agreement among the four rankings was .912 (Kendall coefficient).

Built into the scale are some assumptions and theoretical positions. First, that the highest level of communication requires both oral and linguistic competencies; second, that there is a natural order of communication development; and, third, that language mediation assists conceptual growth.

The lowest items on the scale reflect behaviors that are either primitive or non-verbal in nature; isolated vocalizations and gestural expressions. The sequential behaviors of dramatization and connected vocalizations follow. The advent of signs and drawing indicate the use of imagery and representation, precursors of symbolic behavior (Piaget, 1962). These are followed by the symbolic content of the formal sign system. From here on, the assumption of oral linguistic competence as the ultimate goal is evident: fingerspelling is rated higher than signs, written symbols higher than fingerspelling, and spoken language higher than written language.

The items reflecting spoken types were generated from commonly observed instructional models utilized in classes for the deaf. They include, from lowest to highest: everyday expressions, single word (holophrase), combinations of single words, rote sentence patterns, word groups (linguistic units), and self-generated syntactically accurate sentences.

Absence of negative comment on the remarks section of the teachers' score sheets suggests that the scale reflects current pedagogy in education of the deaf, and provides an instrument which accommodates teaching strategies and learning styles. As statistical procedures later disclosed, the scale's validity and reliability proved to be high, in practical application and in theoretical base.

The Auditory Behavioral Rating Scale

Since hearing threshold is a determining factor in a deaf child's receptive language functioning, there was an initial effort to describe and code hearing threshold, based on the configurations recorded on school audiograms (Huizing, 1959). The following limitations were soon revealed:

1. Variability of inter- and intra-school testers is great. Some schools have part or full-time certified audiologists on staff; in others, testing is done by one or more teachers of the deaf.

2. Test equipment and testing environment vary considerably from school to school. Without standard criteria there was no assurance of test reliability (Rapin and Costa, 1969).

It became increasingly clear that such a survey warranted separate handling and was not within the scope of the present study. The investigation of receptive language functioning centered on the auditory behavioral rating scale developed for the study.

The Auditory Behavioral Rating Scale is designed to estimate the deaf child's progress toward consistent use of his residual hearing. In classrooms for the deaf, a number of auditory environments are possible: no amplification, amplification by an individual hearing aid, and amplification by a group amplification system. Since it was not possible to control the auditory environment, emphasis was placed on observing the child's attitude toward amplification.

A seven-point scale was derived by combining three attitudes toward amplification commonly observed by teachers of the deaf: acceptance, indifference, and distress. (See Appendix F.) Seven items were submitted to three classroom teachers - teachers of nursery, kindergarten, and a special class. Based on their complete agreement, the scale reads from lowest to highest:

1. Has a reputation for unreliable hearing responses.
2. Inconsistent responses; happier when the aid is off.
3. Stable responses; happier when the aid is off.
4. Inconsistent responses; indifferent to amplification.
5. Inconsistent responses; accepts hearing aids.
6. Stable responses; indifferent to amplification.
7. Stable responses; accepts hearing aids.

Results

Tables 31-33 present the results of the analyses of variances for pupil-teacher communication and auditory behavior for three age groups. Communication I designates the primary mode; Communication II, the supportive mode.

At the 3-through 4-year-old age level, Table 31 displays the significant differences between "Typical" and "Special" groups in primary communication mode and auditory behavior. No significant differences appear in the supportive communication mode. This may be a function of the narrow range of communication types available to deaf children at the 3-through 4-year-old age level.

Table 32 presents the results of analysis of variance for the 5-through 6-year-old age group. Again, "Special" and "Typical" groups are differentiated by communication mode. Significant F values were obtained on pupil-teacher communication, both primary and supportive modes. No significant differences occurred on the measure of auditory behavior.

Table 33 presents the results of analysis of variance for the 7-through 8-year-old age group. Significant F values were obtained on pupil-teacher communication, both primary and supportive modes. No significant differences were found between "Special" and "Typical" deaf children on the measure of auditory behavior.

Summarizing the analyses of variances for all age groups, The Pupil-Teacher Communication Scale, based on the child's primary communicative mode, consistently discriminates "Special" and "Typical" groups throughout the total age range tested. The supportive mode, referred to as Communication II, becomes a discriminating factor in the 5-through 6-year-old age group, and continues to discriminate through the 7-through 8-year-old age range.

It is interesting to note that "Typical" children exhibit higher levels of communication behavior in both primary and supportive modes throughout the age range tested. Although both "Typical" and "Special" groups are limited in supportive modes during the 3-through 4-year-old period, "Typical" children move ahead during the 5-through 6-year-old period and continue to extend their range of communication behaviors throughout the seventh and eighth years. Though not always statistically significant, higher levels of auditory behaviors are also evident for the "Typical" group, at all the age levels tested.

The Auditory Behavioral Rating Scale reveals significant differences between children classified as "Special" and "Typical" in the 3-through 4-year-old age group. After that period, no significant differences are found in the auditory behaviors observed in the study. Further investigation is necessary to determine whether this is a function of the limited range of behaviors explored in the present scale, or rather a function of learned behaviors in the children, established early in their schooling and remaining fairly stable thereafter.

Table 34 discriminates between rubella and non-rubella in the 3-through 4-year-old age group. (Samples were not adequately matched in size to make comparisons in other age groups.) A significant F value was obtained on pupil-teacher communication, primary mode. The difference is in favor of the rubella children, suggesting that the rubella children tested in this study function at a higher communicative level than non-rubella children. Caution must be observed in interpreting these results, since the non-rubella group is composed of "Special" children as well as "Typical."

Tests of differences in performance of adjacent age groups, Tables 35-38, reveal no significant differences in the "Special" groups as a function of age. However, in the "Typical" groups, Tables 39-43, there are significant differences between adjacent age groups on the Pupil-Teacher Communication Scale, primary communication mode. Examination of standard deviations at each age level reveals that variance increases with age. These results may be interpreted to mean that there is continuing growth in the range of communication behaviors used by "Typical" deaf children at successive age levels.

Comparisons of performance between 4- and 5-year-old "Typical" deaf children reveal significant gains on all measured communication behaviors. (See Table 40.) It can be concluded that a growth spurt in communication occurs in the "Typical" group during this period. No such phenomenon is observable for the "Special" group in any age category tested, nor in any tested communication behavior.

A significant gain in attitude toward amplification occurs in the fifth year, a period when preschool children have had the benefit of one or more years of individual attention to auditory training. After that year, no significant gains are seen as a function of age or, as may be inferred, school program.

Tables 44-46 present the results of the analyses of variances for pupil-teacher communication and auditory behavior for three age groups differentiated by behavioral ratings. "High" Behavior Rating designates children who exhibit a high number of negative behaviors; "Low" Behavior Rating designates children within a range considered normal for purposes of the study.

On Communication I and II, no significant differences appear as a function of behavior in the 3-through 4-year-old age group. An F value occurs, however, for the measure of auditory behavior. This result bears consideration in light of information revealed by factor loadings. (See Tables 13 through 18.) The Auditory Behavioral Rating Scale and the Behavioral Rating Scale appear to be measuring some of the same behaviors. Nevertheless, the auditory measure does discriminate between "High" and "Low" behavior children at the 3-through 4-year-old age level.

At the 5-through 6-year-old age level, both measures of communication mode discriminate "High" and "Low" behavior children. The children operating within the range of normal behavior appear to be making significant gains in communication over the group exhibiting negative behavior types.

In the 7-through 8-year-old age period, a significant F value appears in the supportive communication mode, and again in the rating of auditory behaviors, suggesting observable differences in the performance of the two groups.

It is not surprising to find that children with behavioral problems function less well than normal deaf children on the communication measures employed in this study.

Discussion

At this time, the Pupil-Teacher Communication Scale can be considered valid and useful; however, it is limited in several regards. So far, it has been applied to pupil-teacher communication only. It can be readily used to describe inter-peer communication.

In either case, the ability of the receiver is a critical factor in the nature of the sender's communication behavior. For example, if a teacher is a proficient user of the language of signs, it is a reasonable hypothesis that a child who knows signs is likely to use them under conditions of stress. The receiver's receptive communication skills should be recorded when the scale is used for individual record-keeping and small group samples.

The "forced choice" approach to determining a deaf child's primary communication mode may be seen as limiting. Normally, deaf children combine communication behaviors to express messages. Their estimate of a sender's sophistication and expectation in receiving various communication types determines the style of their expression. Many teachers noted on the "remarks" section of the score sheet that the children used two behaviors simultaneously. Yet none neglected to make a choice regarding the one used most frequently.

Also, it must be noted that achievement of higher levels of manual communication behavior does not assume that oral levels have been successfully accomplished. Teachers may profit from checking the scale for oral and manual behaviors, comparing the progress of each.

The communication scale has not yet been subjected to item analysis. It is entirely possible that some of the items do not contribute substantially to the scale's value, and could be omitted.

Teachers were invited to note other communication behaviors not listed in the scale. The majority of responses came from teachers of nursery and kindergarten classes, reflecting what may be new behaviors growing out of early identification and amplification: babbling; echoic behavior; jargon; language approximating normal; and talking to self.

It was clear that many teachers were sensitive to children's oral development and interested in contributing more than had been asked. Viewing the scale as descriptive, they suggested additional information be recorded: reluctant to speak; bilingual background; vocal quality; "throat noises" and "peculiar sounds;" and voluntary versus evoked language.

Unfortunately, there were also indications of limited communication background among the teachers. For example, some teachers responded that a child did "not communicate." Yet responses were recorded for these children on other tests in the battery, administered by the very same teachers.

Teachers' comments on the score sheets of the auditory scale indicated: (1) a large number of children wore no individual aid during the test period (we assumed from other identifying information that these were primarily "Special" children and children entering school for the first time); (2) that hearing aids were often in repair, in some cases "for months," and loaner aids were not provided in the interim; and (3) that many teachers recognized discrepancies between the pure-tone audiogram and the child's auditory response under classroom conditions. These included children's responding above or below expectation, based on information available from the pure-tone audiogram.

The pilot survey on hearing threshold disclosed that audiogram forms from several schools for the deaf reveal no information on the child's ability to receive or discriminate spoken language (speech awareness and speech reception thresholds). Persons qualified to administer and interpret tests of hearing for speech are not available in all the schools. Consequently, it must be assumed that the classroom teacher is largely unaware of the individual deaf child's auditory potential, as well as the current status of his auditory reception for spoken language. For typical children, it may be assumed that the hearing threshold, as measured by pure-tone, and the speech reception threshold are highly correlated. Unfortunately, this is not always the case, particularly when the threshold drops steeply. For "Special" children, the two measures are critical. Many children are designated "Special" on the basis of discrepancies in the amount of hearing reported and the amount of hearing used for language learning. Yet "Special" class teachers are not provided with this information necessary for effective program planning.

The investigator's goals for the scales were not completely realized. Although the research design of the CREED 3 study revealed the presence of significant differences in communication behaviors between deaf children designated "Typical" and "Special," the nature of the difference cannot be revealed without further statistical treatment.

The goal of acquiring further information on the emergence of oral linguistic competence was realized to some extent. We have learned that rate differs for "Special" and "Typical" children, and that the range of communication behaviors is smaller for the "Special" group.

Also, the data suggest that for the "Typical" group the preschool experience results in an over-all communication "growth spurt." These children show significant gains on all three measures, between the ages of four and five. Between five and six years, the increase in level of primary mode is greatest, significant at the .01 level. Each successive year shows a statistically significant gain in the

"Typical" deaf child's progress toward linguistic competence. This is an important finding. We can assume that our school programs are effecting a steady and consistent development of communication skills in their "Typical" population. Clearly, we need to know if this progress continues beyond the age of nine years. Application of the pupil-teacher scale to the total school population can provide us with this information.

For the "Special" population, however, we see no significant gains. The composition of the group is so varied that generalizations about communication cannot be made. "Special child" can mean aphasoid, crippled, behavior problem, etc. Communication problems differ considerably among these groups. An interpretation of the group data, beyond the statement that it differs from "Typical," would not provide valid information.

Educational Implications

The data collected in the study reveal that patterns of communication behavior differ widely in the group of children termed "deaf." The discrepancies are apparent throughout the age range tested. Children who make no apparent or consistent use of amplification are grouped for learning experiences with children who appear to like and use amplification consistently.

When data from the Pupil-Teacher Communication Scale and the Auditory Behavioral Rating Scale are used separately or in combination, to screen an entire class, discrepancies in communication functioning are immediately apparent.

Typical Primary Class (ages 7-8 years)			Special Pre-primary Class (ages 4-6 years)		
Child	Communication (1-19)	Auditory Rating (0-7)	Child	Communication (1-19)	Auditory Rating (0-7)
A	11	7 (highest)	A	1 (lowest)	7 (highest)
B	14	7	B	11	7
C	14	7	C	11	6
D	1	0 (no aid)	D	9	7
E	11	0 (no aid)	E	1	1
F	14	0 (no aid)	F	1	7
G	14	1	G	1	7
H	11	1	H	11	6

Assuming there is justification for the groupings seen above, social, emotional, or otherwise, the classroom teacher is faced with the overwhelming task of providing a variety of teaching behaviors to satisfy the needs of all the children in her group. Clearly, children's use of amplification is not a deciding factor in grouping for learning. Yet the use of residual hearing is known to be a factor in language learning. Are other receptive language estimates used for grouping purposes? Are children grouped by ability to speechread? Many questions arise in regard to grouping hearing-impaired children for optimal learning experiences. An analysis and discussion of grouping practices among administrators may prove useful in revealing a range of educational goals.

In a community of schools for the deaf, there is an assumption that collective goals include increasing each child's oral communication skills, insofar as he is able to respond to teaching. Yet there is little evidence that tests which assess communication skills are routinely administered in the schools. The benefits of such testing are many. The ambiguous written reports which offer subjective measures of progress in the communication skills of auditory discrimination, speechreading, and spoken language do not provide classroom teachers with a common referent they can understand. Nor do administrators have objective evidence that individual children are making steady gains, or that a total program is largely effective.

The communication scales developed for this study may be adapted to serve as cumulative record forms, to be marked at the end of each school year. School personnel can view at a glance the gains and plateaus in an individual child's progress toward oral linguistic competence, and toward consistent use of his residual hearing. Although the two measures do not provide adequate information for effective communication skills development, it is our hope that they will continue in use, providing a step toward the development and use of communication profiles in planning educational programs for hearing impaired children.

TABLE 31

Means, Standard Deviations and F Values for
Special vs. Typical Children of 3-4
Years of Age
(Communication Scales)

Test	Special (N=112)		Typical (N=332)		F
	Mean	S.D.	Mean	S.D.	
Pupil-Teacher Communication I	2.90	3.14	4.90	4.89	8.47**
Pupil-Teacher Communication II	3.11	3.33	3.73	3.94	.71
Auditory Behavioral Rating	3.63	2.59	5.40	2.42	27.98**

$F_{.05}=3.86$
$**F_{.01}=6.70$

TABLE 32

Means, Standard Deviations and F Values for
Special vs. Typical Children of 5-6
Years of Age
(Communication Scales)

Test	Special (N=65)		Typical (N=162)		F
	Mean	S.D.	Mean	S.D.	
Communication Scale, Part I	4.86	5.06	7.86	5.76	4.61*
Communication Scale, Part II	4.15	4.28	5.74	4.98	20.93**
Auditory Behavioral Rating	3.68	2.75	5.61	2.19	2.32

$*F_{.05}=3.89$
$**F_{.01}=6.76$

TABLE 33

Means, Standard Deviations and F Values for Special vs. Typical Children of 7-8 Years of Age (Communication Scales)

Test	Special (N=86)		Typical (N=203)		F
	Mean	S.D.	Mean	S.D.	
Communication Scale, Part I	4.59	5.25	8.92	6.53	28.19*
Communication Scale, Part II	4.56	4.34	6.04	4.98	4.27*
Auditory Behavioral Rating	3.77	2.84	4.41	2.88	1.80

$^{*}F_{.05}=3.89$
$F_{.01}=6.76$

TABLE 34

Means, Standard Deviations and F Values for Rubella vs. Non-Rubella Children of 3-4 Years of Age (Communication Scales)

Test	Rubella (N=225)		Non-Rubella (N=219)		F
	Mean	S.D.	Mean	S.D.	
Communication Scale, Part I	4.83	4.78	3.95	4.36	4.10*
Communication Scale, Part II	3.74	4.01	3.41	3.57	.84
Auditory Behavioral Rating	5.11	2.51	4.79	2.64	1.72

$^{*}F_{.05}=3.86$
$F_{.01}=6.70$

TABLE 35

Means, Standard Deviations and t Tests
for Adjacent Age Groups
(Special Children)
(Communication Scales)

Test	4 Years (N=104)		5 Years (N=32)		t
	Mean	S.D.	Mean	S.D.	
Communication I	2.90	3.27	3.94	4.72	1.40
Communication II	3.17	3.44	3.41	4.04	.322
Auditory Behavioral Rating	3.71	2.60	4.10	2.66	.725

$t_{.05}=2.04$

$t_{.01}=2.75$

TABLE 36

Means, Standard Deviations and t Tests
for Adjacent Age Groups
(Special Children)
(Communication Scales)

Test	5 Years (N=32)		6 Years (N=33)		t
	Mean	S.D.	Mean	S.D.	
Communication I	3.94	4.72	5.76	5.36	1.45
Communication II	3.41	4.04	4.88	4.51	1.39
Auditory Behavioral Rating	4.10	2.66	3.27	2.85	1.20

$t_{.05}=2.04$

$t_{.01}=2.75$

TABLE 37

Means, Standard Deviations and t Tests
for Adjacent Age Groups
(Special Children)
(Communication Scales)

Test	6 Years (N=33)		7 Years (N=27)		t
	Mean	S.D.	Mean	S.D.	
Communication I	5.76	5.36	4.81	5.62	.663
Communication II	4.88	4.51	3.33	3.85	1.41
Auditory Behavioral Rating	3.27	2.85	3.81	2.83	.74

$t_{.05}=2.05$

$t_{.01}=2.77$

TABLE 38

Means, Standard Deviations and t Tests
for Adjacent Age Groups
(Special Children)
(Communication Scales)

Test	7 Years (N=27)		8 Years (N=59)		t
	Mean	S.D.	Mean	S.D.	
Communication I	4.81	5.62	4.50	5.16	.26
Communication II	3.33	3.85	5.12	4.51	1.78
Auditory Behavioral Rating	3.81	2.83	3.75	2.89	.10

$t_{.05}=2.05$

$t_{.01}=2.77$

TABLE 39

Means, Standard Deviations and t Tests
for Adjacent Age Groups
(Typical Children)
(Communication Scales)

Test	3 Years (N=58)		4 Years (N=274)		t
	Mean	S.D.	Mean	S.D.	
Communication I	3.74	3.93	5.15	5.05	2.00*
Communication II	3.02	3.14	3.88	4.08	1.52
Auditory Behavioral Rating	5.24	2.61	5.43	2.38	.54

$^{*}t_{.05}=2.00$
$t_{.01}=2.66$

TABLE 40

Means, Standard Deviations and t Tests
for Adjacent Age Groups
(Typical Children)
(Communication Scales)

Test	4 Years (N=274)		5 Years (N=87)		t
	Mean	S.D.	Mean	S.D.	
Communication I	5.15	5.05	6.54	5.02	2.25*
Communication II	3.88	4.08	5.20	4.70	2.52*
Auditory Behavioral Rating	5.43	2.38	6.03	1.83	2.17*

$^{*}t_{.05}=1.99$
$t_{.01}=2.63$

TABLE 41

Means, Standard Deviations and t Tests
for Adjacent Age Groups
(Typical Children)
(Communication Scales)

Test	5 Years (N=87)		6 Years (N=75)		t
	Mean	S.D.	Mean	S.D.	
Communication I	6.54	5.02	9.39	6.23	3.22**
Communication II	5.20	4.70	6.37	5.27	1.50
Auditory Behavioral Rating	6.03	1.83	5.26	2.36	2.34*

*$t_{.05}=1.99$

**$t_{.01}=2.64$

TABLE 42

Means, Standard Deviations and t Tests
for Adjacent Age Groups
(Typical Children)
(Communication Scales)

Test	6 Years (N=75)		7 Years (N=70)		t
	Mean	S.D.	Mean	S.D.	
Communication I	9.39	6.23	7.31	6.17	2.01*
Communication II	6.37	5.27	5.80	5.05	.67
Auditory Behavioral Rating	5.26	2.36	4.97	2.66	.67

*$t_{.05}=2.00$

$t_{.01}=2.65$

TABLE 43

Means, Standard Deviations and t Tests
for Adjacent Age Groups
(Typical Children)
(Communication Scales)

Test	7 Years (N=70)		8 Years (N=133)		t
	Mean	S.D.	Mean	S.D.	
Communication I	7.31	6.17	9.76	6.61	2.56*
Communication II	5.80	5.05	6.17	4.98	.49
Auditory Behavioral Rating	4.97	2.66	5.15	2.41	.46

$^{*}t_{.05}=2.00$
$t_{.01}=2.65$

TABLE 44

Means, Standard Deviations and F Values for
Groups with High and Low Ratings on the Behavioral
Rating Scale (3-4 Years)
(Communication Scales)

Test	High Behavior Rating (N=105)		Low Behavior Rating (N=339)		F
	Mean	S.D.	Mean	S.D.	
Communication I	3.59	3.80	4.84	4.79	1.33
Communication II	3.05	3.41	3.90	3.91	2.53
Auditory Behavioral Rating	3.93	2.69	5.40	2.34	13.42**

$^{**}F_{.01}=6.70$
$F_{.05}=3.86$

TABLE 45

Means, Standard Deviations and F Values for
Groups with High and Low Ratings on the Behavioral
Rating Scale (5-6 Years)
(Communication Scales)

Test	High Behavior Rating (N=51)		Low Behavior Rating (N=176)		F
	Mean	S.D.	Mean	S.D.	
Communication I	4.63	4.75	7.87	5.76	5.97*
Communication II	3.71	3.70	5.88	5.02	4.87*
Auditory Behavioral Rating	4.08	2.69	5.46	2.30	2.28

$^{*}F_{.05}=3.86$

$F_{.01}=6.70$

TABLE 46

Means, Standard Deviations and F Values for
Groups with High and Low Ratings on the Behavioral
Rating Scale (7-8 Years)
(Communication Scales)

Test	High Behavior Rating (N=85)		Low Behavior Rating (N=204)		F
	Mean	S.D.	Mean	S.D.	
Communication I	7.47	6.00	9.39	6.19	.72
Communication II	5.22	4.33	7.00	4.69	4.32*
Auditory Behavioral Rating	3.88	2.68	5.31	2.36	9.14**

$^{*}F_{.05}=3.86$

$^{**}F_{.01}=6.70$

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APPENDIX A

Percentages of Children Passing and Failing Individual Items of Gross Motor Test

TABLE A

Percentages of Children Passing and Failing
Individual Items of Gross Motor Test

Test	Score	Ages 3-4 (N=444)		Ages 5-6 (N=227)		Ages 7-8 (N=289)	
		Special %	Typical %	Special %	Typical %	Special %	Typical %
Standing on one foot	Pass	44.64	64.76	49.23	60.49	65.12	85.71
	Fail	54.46	35.24	50.77	39.51	34.88	14.29
Walking	Pass	85.71	92.17	90.77	95.68	96.51	99.01
	Fail	14.29	7.83	9.23	4.32	3.49	.99
Hopping	Pass 1 item	7.14	11.14	32.31	23.46	20.93	18.72
	Pass 2 items	2.68	9.94	23.08	36.42	52.33	71.43
	Fail	90.18	78.92	44.62	40.12	26.74	9.85
Jumping over line	Pass	72.32	86.75	81.54	95.68	94.19	98.52
	Fail	27.68	13.25	18.46	4.32	5.81	1.48
Sit without looking	Pass	84.82	91.27	87.69	96.30	97.67	97.04
	Fail	15.18	8.73	12.31	3.70	2.33	2.96
Step Hop	Pass	Not Administered		29.23	48.15	55.81	71.92
	Fail			70.77	51.85	44.19	28.08

APPENDIX B

Percentages of Children Passing and Failing Individual Items of VMI Test

TABLE B

Percentages of Children Passing and Failing
Individual Items of VMI Test

Test	Score	Ages 3-4 (N=444)		Ages 5-6 (N=227)		Ages 7-8 (N=289)	
		Special %	Typical %	Special %	Typical %	Special %	Typical %
Thumb Touching	Pass	29.46	36.14	73.85	77.16	80.23	94.58
	Fail	70.54	63.86	26.15	22.84	19.77	5.42
Building a Tower	Pass	61.61	65.06	70.77	84.57	Not Administered	
	Fail	38.39	34.94	29.23	15.43		
Beading	Pass	93.75	97.89	98.46	99.38	100.00	99.51
	Fail	6.25	2.11	1.54	.62	0.00	.49
Scissors Cutting	Pass	73.21	88.55	98.46	99.38	97.67	97.54
	Fail	26.79	11.45	1.54	.62	2.33	2.46
Peg Board	Pass 1 item	25.89	25.90	7.69	1.23	0.00	.49
	Pass 2 items	60.72	64.46	38.46	24.07	18.60	10.34
	Pass 3 items	Not Administered		49.23	74.07	81.40	89.17
	Fail	13.39	9.64	4.62	.63	0.00	0.00
Buttoning	Pass	66.96	77.71	Not Administered		Not Administered	
	Fail	33.04	22.29				

APPENDIX C

Percentages of Children Passing and Failing Individual Items of the Visual Discrimination Test

TABLE C

Percentages of Children Passing and Failing Individual Items of the Visual Discrimination Test

Test	No. of Cards Correctly Matched	Ages 5-6 (N=227)		Ages 7-8 (N=289)	
		Special %	Typical %	Special %	Typical %
Moon 1	0	26.15	8.64	12.79	3.94
	1	18.46	15.44	12.79	4.93
	2	30.77	24.69	26.74	22.66
	3	24.62	51.23	47.68	68.47
Moon 2	0	18.46	7.41	5.82	2.96
	1	12.31	14.81	13.95	3.45
	2	38.46	22.22	29.07	23.15
	3	30.77	55.56	51.16	70.44
Puppy 1	0	41.54	26.54	20.93	15.27
	1	38.46	43.83	43.03	31.53
	2	13.85	20.99	17.44	25.12
	3	6.15	8.64	18.60	28.08
Puppy 2	0	44.61	30.86	30.23	16.75
	1	33.85	36.42	36.05	31.03
	2	13.85	22.84	13.95	24.63
	3	7.69	9.88	19.77	27.59

APPENDIX D

Teachers' Comments

The following is a representative sampling of the comments from the Opinionnaire submitted to the teachers who participated in the Project:

"Training Sessions - excellent, well presented and more than adequate to the task. Materials were well planned and easy to use."

"Manual of Instructions - Addenda made things inconvenient; should have been incorporated into original (as time went on it became less important)." E.F. McDermott.

"Training Sessions - helped greatly with administering tests. Test Materials - on most levels were realistically chosen for our children. However, Association and Sequence Tests were too advanced. Children might have been able to do Sequence Test if teachers would have been allowed to gesture and give more complete directions. Manual of Instructions - clear, helpful."

"The children I tested found many parts quite difficult. Their basic problem concerned their inability to look and follow even the simple directions. The most difficult sections for them consisted of the Thumb-Touching, DLM-Sequential Picture Cards, Concept Sorting, and the Association Test." Sandra Fox.

"The Manual of Instructions was adequate (except for the annoyance of the revisions)." Sister Norma

"Manual of Instructions - good except in the cases of concept sorting and PSS where materials in sample were either inadequate in relation to what was expected in test or materials and instructions in PSS were ambiguous."

"I felt that the test was well prepared and provided a broad overview of the child. The materials were well organized and the directions for administration were clear and precise."

"Good, interesting even for my three year olds although some of the physical tests, the Knox Cubes, Sequential Pictures, Concept Sorting and Association Tests were beyond them. For the most part, though, they elicited valuable information on the individual child's ability. Especially with youngest children I feel more explanation, samples or whatever might have elicited more valid responses.

"Thoroughly enjoyable to give, results were interesting and informative."

"The See Quees, Association Test, and Concept Test items were very difficult for all my children. Also, due to the type of instructions that had to be given, I was often very uncertain whether the child being tested understood what was expected of him." J. Bradley.

"My group of 4-year-olds enjoyed taking the test and were not afraid of it. They became tired easily and I was only able to test for short periods of time. I found that none of the children (4) were able to hop and perhaps this physical activity should be stressed more in the pre-school." Ethel Taub.

"Administration of the test was tedious for it was necessary to give the others enough work to keep them busy, working alone without bothering me. This required much time in making "busywork" materials. It seemed so futile, for results would not be available which put them in a class of 'guinea pigs' this year, at least."

"It was well explained and instructions were clear; in fact, it was fun to administer. It was long though and the children tired of certain sections before completion. I learned a lot about my children as a result and was glad to be included in the project, although it was a lot of work." Mary Jane Roney.

"On the whole the entire test; materials, organization and training sessions were well planned. But, I found the test (administration) tedious. It was difficult to test one child at a time while the other children in the classroom had to be kept busy. A teacher's aide would have been most helpful, especially when dealing with the youngest age group (3-5 years). The test itself was very long, and I found most of the children tiring after a short period of time. Most of them seemed reluctant to start again on another day.

"The training sessions were well conducted; explanations clear and concise. It was worthwhile taking the time to let teachers try to handle the materials in a pseudo test situation. Test materials were generally of good quality. The weakest part involved those that were hand drawn; they were in many cases not clear as to meaning. Manual of Instructions was well written; presented no problem. Administration of test was time consuming but generally interesting to see how each child performed."

"Test Materials - Most of the materials were quite good. The ones which did cause problems were those where pictures were used. The pictures were not very clear and the children became very confused. The See Quees, in particular, caused many problems.

"Manual of Instructions - The manual was very explicit and very easy to follow. There was little doubt as to how to administer the test.

"Administration of Test - I found the testing to be very interesting and beneficial. It taught us much about our children that we may have been unaware of."

"Test materials were for the most part quite adequate. It was difficult for the child to use the crayon provided in the test going between lines. I found that they had to press too hard on the practice card (covered with cellophane) to make the required mark.

"Putting cards in the proper sequence seemed to be, generally speaking, too difficult. Perhaps simpler practice cards and more examples would have made this test more valid. Generally, the tests were interesting and self motivating enough to be enjoyed by the students. This was most beneficial." Catherine Wilcox.

"I was able to observe the deaf child's thinking in relation to abstract and concrete problems. The results of the tests guided me in the formulation of a better curriculum for my group."

"I thought the training sessions were well conducted in that each test was explained as to purpose, administration technique and scoring (in some cases). I found the practice session extremely helpful because it gave the teacher an opportunity to ask questions that could come up during the course of the test.

"I was happy to see that the teacher was trained to give this test. I feel that the child knowing the teacher and the teacher knowing the child creates an atmosphere of relaxation and confidence, both vital to adequate test performance."

"They were unable to perform in the Concept Test due to a lack of understanding of what they were to do. The sample given to introduce this test was not really indicative of what they were going to have to do. The children simply took all the cards and put them into one group." Patricia McKeown.

"I found the CREED tests to be specifically designed and excellently organized. It seems to provide opportunities for testing these children in all areas that they need to be tested in.

"These tests should be incorporated into our school routines. The test materials and manuals were clearly defined in their explanations. Thus we had no difficulty in administering the tests."

APPENDIX E

Individual Communication Descriptions

and

Pupil-Teacher Communication Scale

Memo To: Classroom teachers
Subject: Individual Communication Descriptions

The purpose of the Communication Description is to obtain information about the development of classroom communication modes in normal deaf and atypical deaf children.

Careful observation of an individual pupil's communication reveals his use of a combination of communication types, particularly at times when his motivation to share with you is high.

For this study, we are concerned with a child's spontaneous communication with his teacher. Communication with peers is not a consideration. Normal teacher-pupil communication can best be observed when the child is communicating in situations such as that in which he:

1) reconstructs an event he has just recalled and wants to share at once;

2) answers a direct question: (What happened in the dorm last night?);

3) defends himself by explaining his part in a dispute;

4) explains the problem he is having with an assigned task, and in other similar classroom situations.

On the following page are listed three major Communication Types. Under each heading are descriptions of specific communication behaviors. You are asked to consider the total communication behavior of each child.

First, select from the lists his Primary Mode of communication that which he uses most frequently in his spontaneous interaction with you. Enter the appropriate letter in the box under the heading, Primary Mode.

Then, select the communication behavior used most frequently in support of the Primary Mode. Enter the appropriate letter in the box under the heading, Most Frequently Occurring Supportive Mode.

Next, select the communication behavior used second most frequently. Enter the appropriate letter in the box under the heading, Next Most Frequently Occurring Supportive Mode.

In the space provided under Remarks, record any additional communication behaviors you have noted which are not listed among the three major communication types.

Thank you for your cooperation.

PROJECT CREED 3

A Description of the Deaf Child's Communication Behavior in the Classroom

ORAL COMMUNICATION TYPES

A. Occasional vocalizations (as a substitute for single words or for emphasis)
B. Connected vocalizations or silent mouthing (as a substitute for spoken language)
C. Single word to convey a message
D. "Everyday expressions" - rote patterns: (Stop it. I know. May I go to the bathroom?)
E. Single words combined to convey a message (Mother me home.)
F. Word groups used in messages (John bad boy. No T.V.)
G. Sentence types - rote patterns: (Mother bought me new blue pants. I have no pencil.)
H. Self-generated sentences (Jane cry. Her mother don't want her bike at school.)

MANUAL COMMUNICATION TYPES

I. "Natural" gesture
J. Gestures or signs used systematically
K. Single formal sign to convey a message
L. Successive formal signs to convey a complete idea
M. Single fingerspelled word to convey a message
N. Successive fingerspelled words to convey a complete idea

OTHER TYPES

O. Dramatizes
P. Draws
Q. Writes single word or letter forms (in the air or on the blackboard)
R. Writes successive words to convey a complete idea
S. Uses facial and bodily expression beyond normal expectancy

PROJECT CREED 3

INDIVIDUAL COMMUNICATION DESCRIPTION

CLASS______________________________

TEACHER______________________________

SCHOOL_______________________________

Name	Primary Mode	Most Frequently Occurring Supportive Mode	Next Most Frequently Occurring Supportive Mode	Remarks
1.	☐	☐	☐	
2.	☐	☐	☐	
3.	☐	☐	☐	
4.	☐	☐	☐	
5.	☐	☐	☐	
6.	☐	☐	☐	
7.	☐	☐	☐	
8.	☐	☐	☐	
9.	☐	☐	☐	
10.	☐	☐	☐	
11.	☐	☐	☐	
12.	☐	☐	☐	

Project CREED 3

Pupil-Teacher Communication Scale

A Record of Progress
Toward Oral Linguistic Competence

Pauline M. Jenson, Ph.D.

1. Occasional vocalizations (as a substitute for single words, or for emphasis)
2. "Natural" gesture
3. Facial and bodily expression beyond normal expectancy
4. Dramatization
5. Connected vocalizations or silent mouthing (as a substitute for spoken language)
6. Gestures or esoteric signs used systematically
7. Drawing
8. Single formal sign to convey a message
9. "Everyday expression" - spoken rote patterns: (Stop it.) (I know.) (May I go to the bathroom?)
10. Single written word or letter forms (in the air or on the blackboard)
11. Single spoken word to convey a message
12. Single fingerspelled word to convey a message
13. Successive formal signs to convey a complete idea
14. Single spoken words combined to convey a message (Mother me home.)
15. Sentence types - spoken rote patterns: (Mother bought me new blue pants.) (I have no pencil.)
16. Spoken word groups (John bad boy.) (No. T.V.)
17. Successive written words to convey a complete idea
18. Successive fingerspelled words to convey a complete idea
19. Self-generated sentences (Jane cry. Her mother don't want her bike at school.)

APPENDIX F

Students' Auditory Behavior Check List

PROJECT CREED 3

To the Classroom Teacher:

Students' Auditory Behavior Check List

Every child evaluated by the CREED study must be rated for selected aspects of auditory behavior. Careful attention to the items will aid in the over-all validity of the findings and their usefulness to school personnel.

I. Hearing Aid Use - [check (a), (b) or (c) on the attached sheet]

(a) Does he accept wearing his aid, use it regularly and to advantage? Such a child appears to miss his aid when it is in repair.

(b) Does he appear indifferent to amplification, seeming not to benefit especially from his aid? Such a child shows little difference in auditory behavior with or without his aid.

(c) Does he appear unhappy or distressed by amplification? Such a child may:
make faces or excuses when asked to put on his hearing aid;
frequently "lose" his aid in order to avoid wearing it;
wear the aid, but with the volume turned off.

IIA. Hearing Response - [check (1) or (2) on the attached sheet]

(1) Does he exhibit stable responses to gross sounds, spoken language, auditory training? Such a child appears to be using his residual hearing in expected and generally satisfactory ways.

(2) Is his response to sound unquestionably inconsistent? (If you check this column, you must respond to IIB as well.)

IIB. Inconsistent Response [check (1) or (2) on the attached sheet]

(1) Does he appear to have much more hearing than he employs for language learning?

(2) Does he exhibit unreliable hearing responses, seeming to hear at some times and not at others? Such a child may have acquired a "reputation" for auditory behavior that is erratic, and unlike those expected of a deaf child.

Students' Auditory Behavior Check List

School______________________________ Teacher______________________________

	I. Hearing Aid Use			IIA.Hearing Respone		IIB. Inconsistent Response	
Last Name,First Name	(a)Accepts his aid; Misses it when in repair	(b)Indifferent; Needs Reminding	(c)Happier when it is off	(1)Stable	(2)Inconsistent	(1)Appears to have more hearing than he uses	(2)Reputation for unreliable hearing responses
1.____________							
2.____________							
3.____________							
4.____________							
5.____________							
6.____________							
7.____________							
8.____________							
9.____________							
10.____________							
11.____________							
12.____________							
13.____________							
14.____________							